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An Investigation into the use of Mental Imagery by children with Autism

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Submitted in partial fulfillment of the requirements for the degree Master of Arts in Research Psychology

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I hereby declare that this research project is, except where specified, my own work and has not been submitted for degree purposes to any other university.

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Tracy Hadfield

Abstract

With the increasing prevalence of autism on a worldwide scale, new teaching methodologies need to be explored in order to educate children with autism helping them to achieve their maximum potential. It has previously been established that many individuals with autism use visual opposed to verbal modes of thinking and learning. In this study action research was used to examine if high imagery instructional methods of teaching could be used as a teaching tool for autistic children attending a special needs school.

This study examined whether there was a change in the classroom performance of three autistic children after a 5 month period of high imagery instruction, as compared against a baseline of response to previous instruction, as well as the pattern of verbal and non verbal abilities manifested at time of intake into the programme. Analysis of the results of initial cognitive, language and perceptual tests was thus undertaken for diagnostic purposes, combined with analysis of initial response to teaching prior to high imagery intervention. Once this base-line had been established, analysis of school readiness and scholastic tests was then undertaken pre and post intervention, combined with in-depth interviews with the children's teacher, analysis of developmental diaries and analysis of work done as part of the school programme followed by each child over a five month period of intervention.

At baseline all three children were found to have phonological weaknesses, as evidenced by difficulties isolating onset sounds in words, difficulties with rhyming and difficulties in skills such as blending sounds into words. Two of the children in the sample showed little to no response to the high imagery instruction, and continued to have difficulties with reading and pre-reading tasks involving working with the sound structure of the English language. The third child in the sample showed an increase in phonological skills and in reading, writing and spelling abilities in response to high imagery instruction, as well as an increase in both vocabulary and the non-verbal abilities involved in drawing .

It was noted at base-line as well as throughout the study that visual memory was an area of strength for this child, but not for the other two children in the sample. The child who made progress was also able to use his visual strengths to develop associations between sounds and letters. The conclusions from this exploratory study are that not all children with autism learn through use of visual strategies in teaching. The success of high imagery teaching strategies when used with a child with well developed visual memory abilities would suggest that high imagery instruction could be a useful and successful teaching strategy where children with autism exhibit well developed visual modes of thought. Strengths in visual memory and in visual association may be indicators of the likelihood that a child with autism will respond positively to high imagery instruction.

Key words: autism, phonological difficulties, mental imagery, visual memory, visual association, visual thinking, non-verbal abilities, reading, writing, spelling.

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Chapter 1: Introduction

1.1 Introduction

"Thinking in language and words is alien to me. I think totally in pictures. It is like playing different tapes in a video cassette recorder in my imagination. I used to think everybody thought in pictures until I questioned many different people about their thinking processes." (Grandin, 2000).

Temple Grandin is a high functioning person with autism. She is widely known for describing her personal experiences with autism and how her experiences relate to teaching methods that are applicable to children with autism. Teaching children with autism requires that special attention be given to the unique needs and characteristics of this disorder.

Through her discussions with other autistic individuals, Temple Grandin has found that many people with autism rely on mental imagery and visual methods of thinking. In addition, it is well documented that autistic individuals reflect better abilities in nonverbal and nonsocial problem solving and demonstrate strength in visual perceptual and visual spatial problem solving tasks (Quill, 1997; Zilmer and Spiers, 2001). They appear to have greater difficulties with verbal reasoning, social cognition and tasks requiring verbal processing (Quill, 1997; Zilmer and Spiers, 2001).

Mental imagery was traditionally defined as the presence of picture like representations (mental images) in the mind, soul or brain (Nigel, 2005). Imagery experiences are now understood to be echoes, copies or reconstructions of actual perceptual experiences or images of possible future experiences (Nigel, 2005). According to Kosslyn (2004) during visual mental imagery, perceptual information is retrieved from long term memory resulting in the subjective impression of "seeing in the mind's eye", and this visual mental imagery is the product of the interplay between multiple cortical and subcortical regions (Kosslyn 1994; Kosslyn, Ganis and Thompson, 2001).

Mental imagery is believed to be a quasi perceptual experience, in other words it resembles perceptual experience, but occurs in the absence of appropriate external stimuli (Nigel, 2005). Imagery is often believed to play a very large even pivotal role in both memory (Yates, 1966; Piavio, 1986) and motivation (McMohan, 1973). It is believed to be centrally involved in visuo spatial reasoning and inventive or creative thought. It is also believed to play a crucial role in all thought processes and provides semantic grounding for language.

This study aims to investigate the use of mental imagery by children with autism and examine the response of a small sample of autistic children to a high mental imagery spelling, reading and writing program.

1.2 Autism

Autism was first described by Leo Kanner in the USA in the 1940's and is currently defined as a pervasive developmental disorder. People with this disorder all experience problems with development and have trouble progressing in areas such as language, socialization and cognition which significantly affect how individuals with autism live (Barlow and Durand, 1995). Due to the individualistic nature of the autistic symptoms, Wing (1988) suggested that these conditions constitute an 'autistic continuum' or 'autistic spectrum'. Symptoms range from autistic tendencies, mild, moderate and severe depending on level of functioning (Wing, 1997).

According to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition Revised Text (DSM-IV-TR) (American Psychiatric Association, 2000), the diagnostic criteria for autism are 1) an impairment in social interaction, 2) impairment in communication and 3) restricted repetitive and stereotyped patterns of behaviour, interests and activities. In addition there needs to be delays or abnormal functioning with onset prior to age three years in 1) social interaction, 2) language as used in social communication and 3) symbolic or imaginative play. The above mentioned disturbances must not be accounted for by either Retts Disorder or Childhood Disintegrative Disorder. (See Appendix 1 for full DSM-IV-TR diagnostic criteria for Autistic Disorder.)

Autism is a complex neurological disorder that affects the functioning of the brain. On the basis of diagnostic and related features observed in individuals with autism, early

theories of the neuroanatomical basis of autism have included nearly every part of the association cortex, brain stem, cerebellum and other subcortical regions of the brain (Akshoomoff, 2000). Identification of some of the neural abnormalities in people with autism has allowed investigation of the association of these brain abnormalities with the behavioural deficits that characterize this disorder (Akshoomoff, 2000). Autism is associated with cognitive deficits of varying degrees (Quill, 1997) and there is often an uneven distribution of developmental skills known as developmental discontinuity (Fay and Schuler, 1980).

Studies of autistic children's performance on the Weschler Intelligence Scale for Children-Revised (WISC-R) reveal several consistent patterns although there is no single characteristic prototype (Siegel and Minshew, 1996). However a number of findings have been replicated across studies, indicating that they are characteristic of memory function within this population (Minshew, Williams and Goldstein, 2006). Usually the cognitive profile reflects better abilities in nonverbal and nonsocial problem solving and difficulties with verbal reasoning and social cognition (Quill, 1997) hence performance IQ's are usually higher than verbal IQ's, (Rumsey, 1992 in Siegel and Minshew, 1996). Many children with autism have visual spatial and visual memory skills that far surpass their apparent abilities in the language area (Tirosh and Canby, 1993). Neuropsychological studies of high functioning individuals with autism have been consistent in finding deficits in social cognition and abstract tasks requiring cognitive flexibility, with relative strengths in associative memory, rule based tasks and visuo-spatial organization (Minshew, Goldstein, Muenz and Payton, 1992).

The few studies that have examined individual differences in profiles or single abilities found that somewhere between one half and four fifths of samples of autistic children fit the above mentioned typical profile or deficit (Rumsey, 1992; Siegel and Minshew, 1996). Individuals with Full Scale IQ of lower than 70 are more likely to fit this profile than higher functioning individuals with autism with a Full Scale IQ above 70 (Rumsey, 1992; Siegel and Minshew, 1996). It has been found that only approximately 25% of individuals with autism have IQ scores higher than 70. This IQ level has often been used to discriminate between the higher and lower functioning subgroups (Happe, 1994 in Dennis, Lockyer, Lazenby, Donnelly, Wilkinson and Schoonheyt, 1999).

Autism is often associated with severe receptive and expressive language impairments (Quill, 1997). If speech and language do develop in autistic children, certain abnormalities are common, including echolalia, repetitiveness, literalness of meaning, monotonous intonation and idiosyncratic use of words or phrases (Beukelman and Mirenda, 1998). Individuals with autism may use visual spatial and perceptual skills to compensate for a lack of linguistic understanding by memorizing routines and attending to subtle situational cues that accompany spoken language (Schuler and Prizant, 1987).

Baird, Simonoff, and Pickles (2006) report a prevalence of pervasive developmental disorders or autism spectrum disorders of 116.1 per 10000. The researchers base these findings on a total population cohort of 56946 children aged 9-10 years in 12 districts in southeast Thames, UK, with ICD-10 criteria.2 (Kurita, 2006). According to the National Institute of Mental Health (NIMH), the exact prevalence of autism is unknown, estimates

range from 1 person in 500 to 1 in 1,000 in the USA (NIMH, 2003). Although disagreement exists as to whether the increase in the number of children identified as having symptoms of autism is due to increases in the disorder itself, better diagnostic tests, more inclusive classification guidelines, misdiagnosis, or some combination of these, there is no disputing the fact that autism now affects a significant number of people (Steuernagel, 2005).

Autism affects approximately 2-6 times more boys than girls (Fein et al, 1996). Autism is more prevalent among females with IQ's under 35 and more prevalent among males in the higher IQ range (Barlow and Durand, 1995). To date there is no explanation for these sex-IQ differences (Volkmar, Szatmari and Sparrow, 1993).

Although the causes of autism are still being investigated, many experts believe that the pattern of behaviours from which autism is diagnosed have shown that multiple genes in interaction probably account for the genetic complexity underlying the disorder (Szatmari, 2003). There is strong evidence to suggest that autism can be caused by a variety of physical factors, all of which affect brain development (www.nas.org.uk). The difficulty of establishing gene involvement is compounded by the interaction of genes and by their interaction with environmental factors. For these reasons genetic testing to diagnose a pre-disposition to an autistic spectrum disorder is not, at present, possible (www.nas.org.uk).

1.3 Introduction to Mental Imagery

Mental imagery (varieties of which are sometimes referred to as 'visualizing', 'seeing in the minds eye', 'hearing in the head' or 'imagining the feel of') is described as a quasi-perceptual experience, that is it resembles perceptual experience but occurs in the absence of the appropriate external stimuli (Richardson, 1999; Nigel, 2005). It is a mental picture, an internal representation of objects and past perceptual experiences.

Mental images are understood by their subjects to be echoes, copies, or reconstructions of actual perceptual experiences from their past or at other times they may seem to anticipate possible, often desired or feared, future experiences. Mental images are imitations of perceptions and are therefore thought to be symbols stored in long term memory which refer to something outside of themselves (Eysenck and Keane, 1995; Wadsworth, 1996).

According to Piaget the mental image is a representational construction based on differentiated imitation and internalization of schemes by a subject. The development of mental imagery occurs as children accommodate action schemes associated with actions or objects (Howard, 1977; Gross, 1985). The mental imagery system is constructed during the semiotic or pre operational stage of cognitive development. Storage involves encoding, memorizing and studying whereas retrieval involves recognizing, recalling and reconstructing (Gross 1985).

Four classes or types of imagery can be distinguished: after imagery, eidetic imagery, memory/thought imagery and imagination imagery. After images are those images that remain after a prolonged and/or intense period of stimulation involving at least four sensory modalities. Eidetic images are those of exceptional accuracy and are often exact copies of the original sensory experience. Ahsen (1977) defines eidetic images as 'a normal subjective visual image which is experienced with pronounced vividness'. Memory/thought imagery can be described as the common and relatively familiar imagery of everyday life such as the recall of objects, past perceptual events or actions. Imagination imagery are those images attached to events in one's inner imaginal world and is withdrawn from any perceptual event (Richardson, 1983).

1.4 Mental imagery and Autism

Visual memory for some types of material has been found to be an area of strength for children with autism (Minshew et al, 2006). They have relative success on tasks which rely on perceptual organization and perceptual-motor integration (Green, 1995). Verbal working memory has been considered by some investigators to be a core cognitive deficit in autism (Pennington, 1997). A functional MRI study by Ring et al (1999) indicates that people with autism depend more on the visual parts of the brain.

Grandin's work (1995, 2000) has brought the ideas of visual thinking to the forefront of understanding how autistic children think about the world. Grandin (1995) proposes that children with autism think about the world through a stream of visual images. Due to the

plasticity of the nervous system, it is a possibility that these systems may be expanded to compensate for deficits in language (Grandin, 2000). Visual thinking is very fast and non sequential (Bogdashina, 2003). Very often autistic people have poor auditory short term memory and have difficulty following auditory instructions consisting of three or more steps. However, when these instructions are presented in 'visual steps' via pictures, symbols or photographs the instruction is translated into their internal visual mode and they are able to complete the sequence (Bogdashina 2003).

Many widely accepted intervention strategies for teaching children with autism acknowledge that the optimum learning channel for children with autism is visual. One such program is The TEACCH (Treatment and Education of Autistic and related Communication handicapped Children) program. The TEACCH program began as a research project led by Eric Schopler in 1966 at the University of North Carolina and was established as a formal program in 1972 (Cumine, Leach and Stevenson, 2000). It is now implemented on globally and sets out to provide visual information in a structured and predictable manner enabling young people with autism to make sense of the world and what is expected of them. It involves the manipulation of the physical environment and the provision of visual schedules and visual instructions in order to make expectations clear and highlight important information (Cumine et al, 2000).

A visually based communication system that is also widely implemented with children with autism is PECS (Picture Exchange Communication system). This system was designed by Lori Frost and Andrew Bondy as a system whereby small pictures or cards

used to represent the concrete object is exchanged for the desired item. Once the child understands that they can access desired items through the exchange of a card or picture, the system is used to teach concepts and other abstract ideas (Bondy and Frost, 1998 in Tissot and Evans, 2003).

Another visually based communication system that has been successfully implemented with children with autism on a worldwide scale is Makaton. Makaton is a sign language system whereby objects or concepts are depicted in a series of hand movements (and sometimes through the use of icons or symbols). The communication partner makes these hand movements when expressing ideas or concepts to the child and the child may or may not respond with similar hand movements (Tissot and Evans, 2003). The use of signs and symbols has been shown to aid the facilitation of comprehension as well as the retrieval of linguistic information for expression (Schweigert and Rowland, 1998)

1.5 The Targeted Revisualisation Program

When this study was originally conceptualised, a number of studies were being conducted with learning disabled children at Japari Remedial School in Johannesburg, using a high imagery programme called the Targeted Revisualisation Programme (Els, 2004; 2005; Ravenscroft, 2007). This programme is a high imagery instructional technique that conceptualises mental imagery as integral to the process of learning of the English language by children. The approach had been developed by Professor Charles

Potter, an educational and research psychologist from the Department of Psychology at the University of the Witwatersrand (Potter, 2003).

The Targeted Revisualisation Programme is based on the theories of Jean Piaget and Alexander Luria. It is a method of remediation designed for implementation with children suffering learning disorders affecting, in particular, their English reading, writing and spelling abilities. Through the use of multi-sensory teaching methods and mental imagery to aid the learning of words, the child's orthography of the English language is mediated and their ability to analyse and memorise words and use them in context developed. The model of instruction followed in the programme is hierarchical in nature, conceptualising the remediation of reading, writing, spelling and dictation as involving five sequential levels through which the child must progress to obtain mastery thereof (Potter, 2003).

By following a hierarchical and sequential framework and utilizing high mental imagery techniques as central to the approach taken to the remediation of the development of oral and visual communication abilities, this approach purposes to link language and visuo-spatial modalities on receptive, integrative and expressive levels (Potter, 2003). The child is taught to use perception, mental imagery and language in combination through a process referred to as 'targeted revisualization'. Single words are first visually imaged and spelled orally, then revisualized and written. In later stages this skill is then extended to sentences and paragraphs (Potter, 2000; 2001). The specifics of the implementation of this high imagery approach to remediation will be outlined in Chapter Two.

The Targeted Revisualisation Programme offers a framework for teaching children using visual channels, perception and mental imagery, with the aim of using visual association to code across from the areas of strength in perception and mental imagery to the areas of weakness in the phonological system (Potter 2003; Potter 2006).

Given encouraging results of this approach with children with learning disabilities (MacReadie, 2001; George, 2001; Els, 2003), it was decided to establish whether the procedures could be applied in teaching children with autism. The reason for this was that a number of authors (Grandin, 2000, Quill, 1997) had suggested that children with autism employ visual modes of thinking and learning. This study proposed investigating the use of mental imagery by autistic children specifically in teaching reading, writing and spelling.

This study thus drew directly on the approaches being used with the children in the Japari studies. It also used the scholastic tests being used in the Japari studies to monitor the development of reading, writing and spelling ability. These were supplemented by instruments used by the school psychologist at the Key School, where the study was being conducted.

1.6 Research Aims

The primary aim of this research was to examine the use of mental imagery in teaching autistic children. This research therefore aimed:

1) To document the responses of three six year old autistic children to a teaching programme based on high imagery instruction, against a base line of how they had responded to previous instruction.
2) To establish whether there was change in selected verbal and non verbal abilities in response to high imagery instruction.
3) To establish whether there was improvement in the reading, writing and spelling abilities of the children.

1.7 Research Questions

This research was based on individual case studies of three six year old children with autism, and focuses on the following questions:

1) Can each of the three children use mental imagery in developing memory and revisualization abilities with respect to printed words?

2) Is there improvement in the cognitive, language and scholastic functioning of each of the three autistic children after being exposed to high imagery instruction as indicated by:

    a) Change in the human figure drawing (DAP) scores of these children?
    b) Change in the vocabulary scores of these children?

c) Improvements in the reading, writing and spelling abilities of these children?

1.8 Research Rationale

Schuler and Baldwin (1981) were among the first to suggest that the relatively strong visuospatial strengths of individuals with autism were a 'natural match' for visuospatial symbols (Mirenda and Erickson, 2000). Many children with autism find written language and physical objects easier to process than verbal language (Schuler, 1995,) but they are more often than not dismissed from the literate community (Kliewer, 1998 in Kluth and Latham, 2003). Professionals usually suggest that skills in reading be taught but rarely mention exactly how to go about teaching reading to children with autism (Todd Broun, 2004).

In terms of this knowledge gap, this study focused on the use of mental imagery by children with autism through the implementation of a high imagery reading, writing and spelling program. It aimed to establish if there was change in vocabulary scores, human figure drawing scores as well as the reading, writing and spelling abilities of children with autism who had been exposed to high imagery instruction. It aimed to add to the growing body of knowledge with respect to autism and teaching children with autism.

1.9 Summary of Chapter

This chapter has provided an introduction to this study through the specification of its aims and rationale. The research questions which the researcher intended to address as a result of the implementation of this study were also stated.

The glossary at the end of this chapter provides definitions of the key concepts essential to this research project. These include autism, mental imagery, high imagery instruction and the link between high imagery instruction and autism, as well as terms commonly used in the assessment of reading readiness, reading, writing and spelling.

1.10 Glossary of terms

Alphabetic principle: The relationship between letters comprising a written word, ordered from left to right, and the phonemes in the spoken word, ordered in a specific temporal sequence (Birsh, 1999).

Autism: a cognitive and neurobehavioural disorder characterized by three defining core features namely: impairment in socialization, impairment in verbal and non verbal communication together with restricted and repetitive patterns of behaviour (Cumine et al, 2000)

Bottom-up processing: Processing that is influenced directly by environmental stimuli and by the physical stimulus perceived, prior to proceeding upwards to consider the involvement of higher order cognitive processes (Eysenck & Keane, 2000; Sternberg, 1999).

Eidetic imagery: The ability to retain an accurate, detailed visual image of a complex scene or pattern or the ability to mentally 'see' an image of the original sensory experience (Gray & Gummerman, 1996; Jaensch, 1930).

Hyperlexia: The precocious self taught ability to read words with an apparent lack of comprehension (Mirenda and Erickson, 2000)

Orthography: The writing system of a language, referring in particular to the correct or standardised spelling according to established usage (Birsh, 1999).

Phonics: Paired association between letters and letter sounds (Birsh, 1999).

Phonological awareness: Both the knowledge of and sensitivity to the phonological structure of words in a language, involving the ability to notice, think about, or manipulate sound segments in words. Phonological awareness progresses from rhyming to syllable counting; to detecting first, last and middle sounds; to segmenting, adding, deleting and substituting sounds in words (Birsh, 1999).

Revisualization: A general definition of revisualization is "a memory task in which the person must recall the configuration (shape of a letter or word) in the absence of visual clues" More specifically, as defined by Potter (2002. p. 2) in the context of analyzing, memorizing and retrieving words from memory, revisualization is "the process of analysis of an image formed in response to a stimulus, the process of comparison of the image with the form of the original stimulus, and the process of coding outputs of the image into written or graphic form".

Top-down processing: Stimulus processing that is affected initially by factors such as the individual's past experiences and expectations and high-level cognitive processes prior to the consideration of the sensory data and perceptual stimulus (Eysenck & Keane, 2000; Sternberg, 1999).

Visual Imagery: The mental representation of visual knowledge not presently visible to the eyes (Sternberg, 1999).

Visualisation: The ability to form a mental image of an object (Kolb & Whishaw, 1995).

Chapter 2: Literature Review

2.1 Introduction

In many classrooms students with autism or autistic characteristics are too often dismissed from the literate community (Kliewer, 1998). Many students with autism may fail literacy instruction because teachers are unsure of how to include them, don't see autistic students as capable of benefiting from literacy development or simply don't know how to differentiate instruction for diverse learners (Kluth and Latham, 2003). Skilled reading has much value in today's society and adults that fail to develop effective reading skills are at a great disadvantage. There is therefore considerable advantages to be gained from understanding the processes involved in reading in order to facilitate reading abilities in others.

Given the aim of the thesis is to teach autistic children using high imagery instruction, this chapter will focus first on autism, and the neuropsychological basis of this disorder. It will then focus on reading, writing and spelling, and the development of these skills in children attending a school specialized in teaching children with autism. Finally this chapter will focus on the process of mental imagery, and teaching strategies which use high imagery instruction. The theoretical basis of the program which will be used as the basis for this type of teaching will then be described.

2.2 Neuropsychology of Autism

Neurological Underpinnings of Autism

Several postmortem studies have highlighted areas of anatomic abnormality in the autistic brain. Consistent findings have been observed in the limbic system, cerebellum and related inferior olive (Bauman and Kemper, 2005; Akshoomoff, 2005). In the limbic system, the hippocampus, amygdale and entorhinal cortex have shown small cell size and increased cell packing density at all ages (Bauman and Kemper, 1994), suggesting a pattern consistent with development curtailment. Findings in the cerebellum have included reduced numbers of Purkinje cells, primarily in the posterior inferior regions of the hemispheres (Arin, Bauman and Kemper, 1991). A different pattern of change has been noted in the vertical limb of the diagonal band of broca, cerebellar nuclei and inferior olive with plentiful and abnormally enlarged neurons in the brains of young autistic subjects and in adult autistic brains small, pale neurons that are reduced in number (Kemper and Bauman, 1998). These findings combined with reported age related changes in brain weight and volume (Courchesne, Karns, David, Ziccardi, Carper, Tigue, Chisum, Moses, Pierce, Lord, Lincoln, Pizzo, Schreibman, Haas, Akshoomhoff and Courchesne, 2001; Sparks et al 2002) have raised the possibility that the neuropathology of autism may represent an ongoing process. Identification of some of the neural abnormalities in people with autism has allowed investigation of the association of these brain abnormalities with the behavioural and cognitive deficits that characterize this disorder (Akshoomoff, 2000).

Neural basis of language, communication and social development

Many studies have demonstrated that the regional specialization of functions observed in adults, such as language and higher cognitive functions is not present at the time of birth (Akshoomoff, 2000). Development involves a process of competition and recruitment that takes advantage of regional differences in 'computing style' that are in place in early development (Elman et al, 1996). Neurobiological evidence indicates that the development of the cerebral cortex depends on interactions with the environment and the process of learning may induce large changes in the structures that are involved in learning (Quartz and Sejnowski, 1997). Studies have found that the neural structures involved in the process of language acquisition are not limited to the 'language areas' of the left cerebral hemisphere (Akshooomoff, 2000).

Language development in verbal children with autism is characterized by a discrepancy between language knowledge and language use (Quill, 1997). There is some evidence that the right hemisphere plays an important role in some aspects of communication used to accomplish certain social goals (Akshoomoff, 2000). Studies of morphology, syntax, semantics and pragmatics show normal acquisition of each linguistic element but impaired functional use (Quill, 1997). Autistic children display less flexibility in the use of various morphemes (Tager-Flusberg, 1989), grammatical structures (Waterhouse and Fein, 1982), vocabulary (Lord, 1985) and semantic relations (Quill, 1985 in Quill, 1997). The restricted manner in which each element is analyzed and organized appears to limit the children's flexible access to the information. Retrieval cues have been shown to

support the children's recall of language information (Tager-Flusberg, 1991) and thus can be a means to facilitate language use.

Studies of patients with brain damage indicate that one system can be damaged while another system can be normal. It is possible that due to neural plasticity, the systems that are intact may be expanded to compensate for the systems that are damaged (Huttenlocher, 1984). In autism the systems that process visual spatial problems are intact and it is believed that these systems may be expanded to compensate for deficits in language (Grandin, 2000).

Two neurodevelopmental models of autism

Waterhouse et al (1996) proposed a *Complex Neurodevelopmental Model* of autism to account for the heterogeneity of symptoms and etiologies of autism. It proposes four neurofunctional impairments, which can be linked to relatively distinct neural regions and circuitry (Zillmer and Spiers, 2001), that in interaction account for the social and related behavioural disruptions of autism. *Canalesthesia* involves the fragmented processes of incoming information from the different sensory modalilities. As a consequence of this fragmentation, sensory information in consciousness, working memory and declarative memory fails to integrate properly resulting in distorted representations of the information. Dysfunction of the hippocampus and amygdala of the temporal lobes produces canalesthesia and impaired assignment of affective significance respectively. *Impaired affective assignment* is the disrupted linking of appropriate emotional meaning or significance to novel and social stimuli. This disruption impairs appropriate responses

to new situations and social actions of others. *Asociality* is a profound disturbance of normal social attachment and interdependence with others. Social interest and bonding motivation are minimal or lacking all together. Asociality relates to the aberrant functioning of three interrelated neurochemical systems: oxytocin and vasopressin neuropeptide, endogenous opiate and serotonin. *Extended selective attention* is an overextended attentional focus and inordinate delay in shifting attention, resulting in a variety of inappropriate responses such as hypersensitivity to sensory input and perseverative behaviours. Extended selective attention is viewed as a consequence of disruption to the temporal and parietal association areas. Although each of these supporting neural regions and circuitry links to specific broad functions they interact and overlap in producing the deficits that the autistic child displays (Zillmer and Spiers, 2001). An autistic individual can present all four of these impaired neurofunctional systems, however some individuals present three or less impairments (Zillmer and Spiers, 2001).

PET and functional MRI studies have demonstrated that the cerebellum is activated during a range of cognitive operations such as attention, learning novel skills and complex problem solving that are also deficit with autism (Akshoomoff, Courchesne and Townsend, 1997). This has led Courchesne and colleagues to develop *The Cerebellum and Attention Hypothesis* model that attempts to incorporate behavioural and cognitive findings in autism with neuroscientific discoveries about the systems that appear to be affected in autism (Courchesne, 1995; Courchesne, Townsend, Akshoomoff, Yeung-Courchesne, Press, Murakami, Lincon, and James, 1994). In this model attention is

viewed as a critical deficit in autism. These attention deficits are hypothesized to be present from early development and thus contribute to the development of atypical social and cognitive deficits that characterize this disorder. In this model, the language problems in autism are viewed as secondary or as the result of an inability to deal with social input. Courchesne (1995) hypothesized that the attentional abnormalities that are so pervasive in autism are the result of early damage to subcortical systems, particularly the cerebellum. Various studies have demonstrated that damage to the cerebellum leads to extremely slow attention orientating (Townsend and Courchesne, 1994; Townsend et al, 1999; Townsend, et al, 1996). Stimulus over selectivity or over selective attention has been reported in many individuals with autism (Akshoomoff, 2000). It appears that over selective attention is found primarily in individuals with autism who have parietal cortex abnormalities in addition to the previously described cerebellar abnormalities (Akshoomoff, 2000). Through these various above mentioned studies, evidence supporting *The Cerebellum and Attention Hypothesis* model, showing that slowed attentional orientating in autism is related to cerebellar vermis abnormality, has emerged.

2.3 Reading, Writing and Spelling

Reading

Reading can be defined as the ability to extract visual information from the page and comprehend the meaning of the text (Rayner and Pollatsk, 1989). Some of the processes involved in reading are concerned with identifying and extracting meaning from individual words, other processes operate at the level of the phrase or sentence and still

other processes deal with the overall organization or thematic structure of an entity, story or book (Rayner and Pollatsk, 1989).

According to Piaget, learning to read and reading are receptive aspects of dealing with written language. The parts are learning to write and spell, which form the expressive aspects of written language. Reading, writing and spelling should therefore be taught simultaneously as they are merely the receptive and expressive aspects of a singular entity, namely written language (Wadsworth, 1996).

It may seem obvious that the end point of reading therefore ultimately comprises the reading and understanding of sentences which join logically to form passages of coherent, connected text, the purpose of which is to inform, instruct or perhaps just entertain the reader (Bryant & Bradley, 1985). However studies conducted and models proposed of skilled reading to date have tended to focus their attention on the readers ability to recognise individual words, which is a requirement unique to the ability to read, as opposed to comprehension skills which are also required for successful verbal communication (Goswami, 1988; Harris & Coltheart, 1986).

Bottom up and Top Down processes

Johnston & McCelland (1980, in Ellis, 1993) proposed a model that suggested a *bottom up approach* to the recognition of words. Bottom up theories focus firstly on the perception of physical or environmental stimulus, thereafter systematically proceeding upwards, typically in a hierarchically manner, to consider the involvement of higher order

cognitive processes on perception and in the performance of the required task or skill (Eysenck & Keane, 2000; Sternberg, 1999). Bottom up learning processes suggest that children begin the reading process by identifying letters. The child will then build from letters to words to sentences and so on, until the child is able to grasp the meaning from the text (Templeton, 1995). It is suggested hat children who cannot decode the words on a page will struggle to gain meaning from the text (Moats, 1999). Therefore providing complete instruction into the phonics arena also provides the reader with a schema for classifying the words and letters (Brown, 2002). Researchers from the National Institute of Health (NIH, 2000) agree that the affective teaching of reading includes teaching phonemic awareness and phonics. Once the child is able to develop a classification system for syntax and phonology then they may be able to develop what is called automaticity where words are recognized rapidly and accurately with minimal attentional resources (Resnick and Weaver, 1979).

By contrast, top down theories focus initially on the influence of high-level cognitive processes, existing knowledge and prior expectation thereupon, following which the involvement of sensory data such as the perceptual stimulus is considered (Eysenck & Keane, 2000; Sternberg, 1999). Top down processes suggest that reading is basically processing the meaning of words and sentences before processing the actual make up of the words themselves (Brown, 2002).

Klein et al (1991) discuss a third ideology to reading known as the eclectic model of reading. This model suggests a competent mix of both bottom up and top down

processes. This view recognizes that it is important to learn about the construction of text but also recognizes the importance of the reader's background knowledge in determining meaning (Templeton, 1995).

The development of reading, spelling and writing abilities

Frith (1980) proposed that reading proceeds by the successive acquisition of three consecutive processing strategies, including the logographic, substantially alphabetic and orthographic strategies.

The *logographic strategy* comprises visual word recognition through the identification of salient features of familiar words, such as *yellow* recognized through the *ll.* In the logographic stage reading is based on crude visual features and so visually similar words may be confused. There is no value given to letter order within words. Spelling at this stage is negligible.

The *substantially alphabetic strategy*, as described by Frith (1980), develops thereafter once the child commences to read under formal instruction, thereby learning letter-to-sound and grapheme-to-phoneme correspondences. During this second stage, the child is able to 'sound out' unfamiliar words and decode 'regular' words successfully, although remains unable to do so for 'irregular' words. Achieving this understanding is often a barrier for children (Snowling, 1987). When this ability is incorporated into reading, children are able to attempt to read words they have not previously encountered. Phonemic awareness is not the only requirement for the child to master the alphabetic

stage. The child must be able to segment sounds, memorize the segments and sequence them. Therefore, there is a reliance on auditory and phonological processing. Children who have suffered from speech and language problems often find it difficult to advance to this stage.

The final stage as proposed by Frith (1980), entails the *orthographic strategy* which is non-phonological in nature, corresponding to the automatic, skilled strategy as employed by adult readers, by which familiar whole words and orthographic units such as *'pre'* in *present* are recognized. This strategy is therefore a flexible one that permits decoding of familiar words and unfamiliar words by analogy with familiar orthographic sequence.

According to Frith (1980), as mentioned above, the acquisition of these three strategies is not only apparent in *word recognition development* (i.e. in reading) but also in the *production of words* (i.e. in writing). Thus, according to Frith (1980), the logographic strategy develops first for reading, transferring thereafter to spelling. The alphabetic strategy becomes apparent in spelling first however, only transferring to reading at a later stage. Like the initial strategy, the orthographic strategy is also primarily available for reading first, only transferring thereafter to spelling.

Whilst Frith's (1980) model clearly specified distinct stages through which the acquisition of reading and spelling proceed, Broom (2001) argued that it is vague in its clarification of the exact nature of the relationship between these stages and offers no explanation as to why the logographic strategy should be established before an alphabetic

strategy. In addition, Broom (2001) noted that while Frith's (1980) model suggested that the orthographic stage developed by the merging of the logographic and alphabetic strategies, how this might happen is not elaborated upon. Furthermore, Broom (2001) considered that Frith (1980) did not specify each stage in accordance with a modular information processing system, and as a result, the relationship between the developing structures and those of the ultimate skilled model remain unclear.

Through extensive research and literature review in this regard, *Ehri (1991; 1994)* has identified four phases which appear to be most commonly hypothesized and strongly supported by research evidence.

According to Ehri (1991; 1994), in the initial stage or the *logographic phase* of reading acquisition, it is widely held that reading is visually based and proceeds via the use of partial cues relying on visual contextual or graphic features to read words. At this stage, the child has no strategies for deciphering unfamiliar printed words (other than the visual approximation to known words) and spelling is restricted to a few words learned by rote.

The next two stages according to Ehri (1991; 1994), referred to as the *transition from logographic to beginning alphabetic phase* and the *alphabetic phase* respectively, reflect the child's starting ability to decode words using knowledge of the mapping between letters and sounds. The alphabetic stage is characterized by the ability of the child to use letter-sound relationships to read words or, as described by Harris and Coltheart (1986),

the phonic procedure. Spelling using sound letter correspondence is also believed to become possible at this stage.

In the final stage of literacy development as proposed by Ehri (1991, p.1051), referred to as the *orthographic stage*, the child learns to utilize alphabetic principles but also predictable letter patterns and groups in "orthographic neighbourhoods" that form patterns larger than sound-letter correspondence. It is during this last phase that reading and writing are automatic processes, the mapping between print and sound being at the phonemic level, with the child developing into a skilled reader. During this phase, patterns and groups are established in memory, thus allowing the child to more readily utilise the whole word procedure, as described by Harris & Coltheart (1986; Ehri, 1991; 1994).

Thus according to Ehri (1991; 1994), for the skilled reader in the final stage, *orthographic, phonological and semantic processes are integrated, parallel processes* that occur simultaneously in coordinated networks, as suggested by the McCelland and Rumelhart model (1981). Ehri (1991; 1994) noted however, that since the interactive model has been extrapolated primarily from the use of word analysis knowledge by the expert reader rather than the beginning reader, caution must be used when interpreting it in this regard. Similar to Harris & Coltheart (1986), Ehri (1991; 1994) also considered that it is through sequential development and practice that skilled readers are able to make use of both whole word and phonic procedures to read successfully.

The Dual Route processing model has great explanatory power when describing how skilled readers read (Harris & Coltheart, 1986). There are two possible cognitive processes a reader has at their disposable to read a word, the lexical and the non-lexical route (Harris & Coltheart, 1986). If a word is known, then the reader will use the lexical route to read the word, drawing from the mental lexicon of known words. If a word is unfamiliar, the reader will use the non-lexical – or phonological – route, using phonic conversion to read the word (Harris & Coltheart, 1986). This model is most congruent with the congenital definitions of dyslexia.

Although it is possible for the two routes to function independently, it is also possible for them to interact. Ellis, 1993, using a sample of skilled writers, dictated nonwords preceded by real words. It was found that how the nonwords were spelled depended on what the preceding word was. For example, the sample was asked to spell /prein/. If the word before was /brain/, they tended to spell it /prain/. If the word before was /crane/, they tended to spell it /prane/. This suggests that the sample retrieved some information from the lexical route (the known part) and then used the sub lexical route of phoneme-grapheme conversion to complete the word. In fact, Lennox & Siegel, (1998) suggests that not only is this integration possible, it is *necessary* for good spelling. This is relevant to the order in which the words in a spelling test are read out. Knowledge of the spelling of some words may influence the spelling of other words.

From this understanding of how skilled readers use the Dual Route processing model, Harris and Coltheart (1986) have outlined four phases in learning to read English: *the*

sight-vocabulary phase; the discrimination-net phase; the phonological-recoding phase and the orthographic phase.

In *the sight-vocabulary phase*, a child can read a small number of words via the direct (or lexical) method, words that they read by 'sight', but unknown words cannot be read. However, there is evidence that it is not just the overall shape of the word to which the child attends, but also some knowledge of the individual letter shapes in that sequence. When children enter school, and begin formal reading instruction, they move into the next phase.

During *the discrimination-net* phase a child reads by making use of fragmented cues in words. The overall shape of a word is important (meaning that whole-word reading is being used). Children look for cues matched against learned words. That is, if a word is the same length as a known word, it will be read as that word – irrespective of the actual letters. Or any word containing a certain letter will be read as a specific known word. At this phase, children rely on a specific pool of words using prominent visual cues to choose the most likely reading of the word. As their reading vocabulary increases, the discrimination-net method of reading becomes difficult and so children move into the next phase.

During *the phonological-recoding phase* the child begins to show evidence of using letter-sound conversion rules (phonics), and begins to be able to read nonwords. There is a vast increase in the number of words the child can read aloud. Children are now using

the phonological (nonlexical) route as well as the direct (lexical) route to read, though the phonological route appears to be dominant during this phase. Research has shown that a child's reading ability at this phase is determined more by the ability to use phonics (the phonological route) than by ability to use the direct route (Harris & Coltheart, 1986).

At *the orthographic phase*, it is the spelling of the word that determines how it is read, rather than the sounds of the letters. This allows for reading of homophones and irregularly spelled words, which is necessary for skilled reading, although some use is still made of phonological processing. At this phase, the direct route becomes dominant again.

It has been credited to the influence of Piaget that led us to the belief that "children learning to read pass through an identifiable series of distinct stages in the acquisition of the skill" (Ellis, 1993: 78). From this base, many psychologists have tried to explain reading development through stages models, some of which have already been discussed here. Others include models by Ehri (1993), Marsh, Friedman, Welch & Desberg (1981) and Henderson and Templeton (1986). Although these models all have their own specifics, they do share some common qualities (Ellis, 1993).

The first of these can be called 'words as pictures'. Most models propose that in the earliest stages of learning to read, words are identified exclusively on their visual appearance, much as one might recognise a picture. What this means is that children are making no use of letter-sound correspondence, and cannot read unfamiliar words. They

are not able to 'sound-out' new words. Children will often make semantic errors, because they have recognised and understood the word. They may also use visual indicators as to what the word may be, for example, 'yellow' is a known word and has a /ll/ in the middle and therefore 'sma**ll**er' (an unknown word) is read as 'yellow'. Finally, they may make use of the context of the sentence to *guess* the right word without making any reference to the unknown word.

Once children are taught the relationship of spelling-sound of words, they are learning about phonics. Now children are able to sound out unfamiliar words. As has been discussed already, regular words can be read correctly via this method; irregular words cannot. As this understanding of spelling-sound relationship becomes more complex, the child becomes a more skilled reader. New words are stored in the visual input lexicon and the speech output lexicon, and the semantic system becomes more comprehensive. With all these processes, reading becomes quicker and more accurate.

Predictors for reading development

Literature in the field has identified that the following factors predict reading (and spelling) ability:

1. Phonological ability (e.g. Schatschneider & Torgesen, 2004; Uhry, 1999)
2. Oral language ability (e.g. Soifer, 1999)
3. Phonemic awareness (e.g. Moats; 1995; 1996; National Reading Panel, 2000).

4. Orthographic knowledge (e.g. Cardoso-Martins & Pennington, 2004; Badian, 2005)
5. Rapid naming ability (e.g. Schatschneider & Torgesen, 2004; Sunseth & Bowers, 2002; Cardoso-Martins & Pennington, 2004)
6. Short-term memory (e.g. Schatschneider & Torgesen, 2004)
7. Morphological knowledge (e.g. Nunes, Bryant & Olsson, 2003)

One difficulty in interpreting the literature in the area is that not all of these predictors are independent abilities, and there is some amount of interdependency as these factors develop in children at school. Also, although these abilities tend to predict a child's reading ability, there is evidence that as a child's reading ability improves, two-way learning occurs (Morris, Bloodgood, Lomax & Perney, 2003). That is, learning to read then enhances these skills (Cunningham & Stanovich, 1991).

Phonological Awareness and Reading Ability

Of the factors found to predict reading ability, phonological awareness has proven to be the strongest and most stable predictor (Savage & Carless, 2004). Phoneme awareness can be defined as the awareness of speech sounds and is an aspect of a more fundamental linguistic competence known as phonological processing (Moats, 2000). Phonological processing is the ability to identify, manipulate, produce and remember speech sounds (Moats, 2000). Phonemic awareness emerges when children begin interacting with print and learning how letters in spelling maps sounds in pronunciation (Ehri, 1985). Although beginner readers may bring some phonemic insights from their experience with speech,

orthography helps them stabilize and organise their phonetic knowledge and teaches them the full system (Ehri, 1985).

An important part of helping children with reading disabilities figure out the system underlying the printed word is leading them to understand the alphabetic principle (Adams, 1990) According to the National Reading Panel in the United States: An essential part of the process for beginners involves learning the alphabetic system, that is, letter-sound correspondences and spelling patterns, and learning how to apply this knowledge in their reading (National Reading Panel, 2000).

A number of studies have indicated that phonological awareness is causally related to the development of reading and writing skills (Bradley and Bryant, 1985; Brady, 1997; Carrol, 1986). Becoming phonologically aware prepares children for later reading instruction, including instruction in phonics, word analysis, and spelling (Chard and Dickson, 1999). There is also limited evidence available to support the importance of the role that phonological coding plays in skilled reading (Eysenck and Keane, 2000).

Overall, however, research suggests that the role of phonological mediation in reading and writing is less successful in children suffering learning disorders. It also tends to decline with age, with children in higher grades at primary school being able to identify words by their orthographic patterns and to recognise common words as complete units through the influence of visual as opposed to phonological coding as proposed by

numerous of the models of reading, and through the influence of the word superiority effect (Brady, 1997).

As a result, particularly of the importance placed upon reading and writing ability within contemporary society, considerable research effort has been devoted to identifying predictors of the progress of children's learning to read and write (Uhry, 1999). As a highly complex and unnatural task, when learning to read and write in an alphabetic script such as English, the child is required to gradually learn that printed words convey meaning, that the graphemes of printed words map on to the speech segments at the phonemic level and that there are irregularities in these mappings.

In addition, when reading text, children also have to integrate the meaning of words within phrases and sentences using knowledge of syntax and semantics, thus developing the ability to not only comprehend words as units but rather the text as a whole, which is the ultimate purpose of reading (Carreker, 2005).

Spelling

In comparison to the large body of research focusing primarily on reading as apparent from the discussion above, the study of spelling to date however, has been somewhat neglected (Trieman, 1998).

To spell, the speller is required to *translate spoken words* into their *corresponding printed symbols*, attributing to each speech sound in the spoken word a written letter or

letters. In this manner therefore, the speller is able to represent spoken words with printed symbols. From this simple description of spelling however, it would thus appear that spelling and decoding are simply inverse operations which purely require knowledge of sound-symbol correspondences and are performed in a directly inverse fashion to each other. Following this logic therefore, it could be assumed that if a learner were able to read a word, they would then naturally be able to spell it too (Carreker, 2000; Frith, 1980). However, although both decoding and spelling require phonological and orthographic knowledge, Frith (1980) highlighted that they are not merely inverse operations to each other.

For young children, Treiman (1998) argued that spelling involves a *creative linguistic process* rather than habitual learning involving rote visual memorisation. Treiman (1998) considered that young children create spelling for words based on their knowledge of language and their knowledge of print, noting that many of children's common spelling mistakes make sense once the knowledge that they bring with them into the spelling task has been taken into account. Treiman (1998) highlighted that as children progress, their knowledge of the spelling system grows and deepens, thus enabling them to become progressively better spellers. Treiman (1998) highlighted four changes that tend to occur with increased spelling skills including, firstly, the internalisation of classification of sounds that are embodied in the conventional orthography, secondly, becoming increasingly reliant upon conventional spelling, thirdly, the rapid learning about letter patterns in printed words and, finally, reaching an understanding that morphemes are often spelled in a consistent fashion.

In the classroom however, spelling is typically treated as an *afterthought* to or as a by-product of *reading*. The assumption is that if students learn to read, they learn to spell and as a result, spelling instruction is given little importance and minimal attention during the instructional day (Carreker, 2000). Furthermore, this view fails to recognise the integral role spelling instruction plays in learning to *read* since it has been shown that spelling instruction enhances reading proficiency through the reinforcement of letter patterns (Adams, 1990, in Carreker, 2000). Moreover, it has been argued that spelling is a more difficult skill to learn in comparison to reading. As noted by Carreker (2000) therefore, spelling instruction should be intimately integrated with the teaching of reading but, because spelling has its own distinctive characteristic and demands, it should also be distinct from reading and explicitly taught. Carreker (2000) argued that spellers must be taught in a manner that will increase awareness and memory of letter patterns and words, considering sequential multisensory structured spelling instruction to be particularly useful in this regard.

Comprehension

As evident from the above discussion, reading refers to the *ability to perceive and understand written language and, as such, is dependent upon a complex cognitive system* comprising both skills and knowledge ranging from visual discrimination of symbols and decoding of single words to comprehending and constructing the meaning of text (Rayner & Pollatsek, 1989). The skills that constitute reading therefore, do not occur in isolation from each other, but are highly interactive. Any separation or delineation which has been

suggested in the discussion thereof is purely artificial to allow for increased clarification in this regard. Furthermore, as highlighted above, some of the knowledge required for reading may be shared with other cognitive systems such as language comprehension and visual perception (Broom, 2001).

However, the decoding and comprehension components of reading represent complete conceptually distinct systems of ability that can function independently, as evident by the double dissociation of functions between *autism and hyperlexia*, both characterised by excellent decoding but poor comprehension (Frith & Snowling, 1983, in Broom, 2001). However, each component is necessary for reading and neither is sufficient in itself and researchers to date have tended to focus on either one or the other of these two major components of reading (Broom, 2001; Stothard & Hulme, 1996).

In consideration of reading and writing comprehension abilities, (Ruddell & Unrau, 1994) considered that children entering pre-primary school and the early grades have acquired many concepts and much world knowledge. Research has shown that children at this age therefore have definite syntactical or sentence-structure knowledge and are able to understand story or text structure. Schema theorists in particular, have provided valuable insight into how children organize and use their own personal background experiences to construct meaning from text, suggesting that schemata develop from children's experiences to form specific knowledge modules defined by a related group of concepts. *Personal experiences* and *interactions* with others are therefore key to this development, leading to abstract representations of these encounters. In this regard, the

schema theory perspective views the mind as a highly complex set of cognitive structures that serves to receive, sort, classify and hold information about events and objects (Hochman, 2000; Ruddell & Unrau, 1994; Stothard & Hulme, 1996).

According to this view, *comprehension* processes therefore are thought to involve the organization, building and reorganization of information by forming *schemata* into which new information is subsequently incorporated. Comprehension processes therefore, are considered to be driven by the child's desire to make sense of experience and thus further influenced and shaped through their social interactions and events. As the child moves from being a beginner reader or writer to the increasingly advanced reading and writing stages, their knowledge of and familiarity with lexical, syntactical and text structure schemata directly influences their success in constructing meaning from text. Equally instrumental in children's construction of meaning is their growing knowledge about the word, text and immediate, remembered or anticipated social interactions (Hochman, 2000; Ruddell & Unrau, 1994; Stothard & Hulme, 1996).

Targeted revisualisation is underpinned by the assumption that words are important in their context, and that, as suggested by Ruddell & Unrau (1994), reading and writing do not purely involve the ability to work with individual words, but rather also sequentially in the *context* of sentence, sentences in the context of paragraphs and paragraphs in the context of stories, influenced by and relevant to the child's own personal life experience and interactions with significant other (Potter, 2003; Sfetsios, 2002). Thus, in the implementation of high imagery techniques, children are encouraged to utilise words in

context and to revisualize sentences and paragraphs in the latter levels. Mind mapping and identification of key concepts in paragraphs in the latter levels are also aimed at facilitating the development of the child's comprehension abilities and expansion of schemata. Illustration of text and allowing the child to take control of their own learning process and to guide sessions, with the tutor assuming a facilitating role only, emphasises the importance of allowing the child to take control of their own learning and to make the English language meaningful and relevant to their own lives and personal experience (Potter, 2001; 2003).

Neuroimaging Studies of Reading Development

In more recent years researchers have turned their focus to the neurological basis of reading and reading disability. Substantial evidence suggests that in non impaired (NI) readers, skilled reading is related to the development of a highly organized cortical system that integrates orthographic, phonological and lexical semantic features of words (Pugh et al, 2001a). This system involves two consolidated left hemisphere (LH) posterior reading systems, a dorsal (temporo-parietal) region and a ventral (occipito-temporal region). The dorsal region performs the function of learning to decode print and the ventral develops with reading experience into a system that recognises words in a fast automatic manner (Pugh et al, 2000; 2001a; 2001b).

In contrast for reading disabled (RD) readers this neurological pattern is disrupted reflecting a dissociation in processing of the orthographic, phonological and lexical semantic features of words (Pugh et al, 2001a). Neurologically this dissociation is

characterized by an increased reliance on the inferior frontal gyrus (IFG) and right hemisphere (RH) homologues of the LH posterior systems. These frontal and RH developments are compensatory and may reflect an inability to use linguistic information appropriately. The shift to the inferior frontal sites suggests an increased reliance on articulatory recoding in an attempt to cope with phonological analysis. In addition the RH shift might reflect a development of nonphonological-based visuo-semantic pattern recognition in order to support the semantic aspects of word reading (Pugh et al, 2001a).

Studying these hemispheric differences has tremendous potential to reveal critical components of higher level processing, because the two hemispheres share similar gross structure and input and output pathways, yet differ in cognitive processing (Beeman et al, 2000).

2.4 Reading, Writing, Spelling and Autism

Research has shown that individuals with autism and the most severe cognitive impairments can learn readiness skills including sight word identification (LaVigna, 1977; Duran , 1985; McGee, Krantz and McClannahan, 1986). In addition they can learn to recognize isolated words and phrases (Lanquetot, 1984 in Mirenda and Erickson, 2000). There is very little research however, regarding the ability of people with autism to comprehend paragraph length or longer text. In one study, however, Rousseau, Krantz, Poulson, Kitson and McClannahan,(1994) provided evidence that interventions that were

effectively used with students with disabilities to increase clause length, phrase length and frequency of adjective use were also effectively used with children with autism.

The only conclusion that can be drawn from the extant research regarding autism and literacy is that no one yet knows what type of intervention is best (Mirenda and Erickson, 2000). Many children with autism seem to function well when given a systematic set of guidelines to apply as provided for by bottom up methodologies (Brown, 2002). Richman (2001) stresses that structure is very important when working with children with autism and a structured phonics approach provides the student with autism a chance to develop a template or schema with which to examine written text. Temple Grandin suggested that she would not have learned to read if it had not been for phonics (Quill, 1995). Dalrymple (1989) suggests that a teacher should try and teach specific skills of reading, which may allow the child with autism to be better able to progress through the reading process. Providing a structured and systematic program is also necessary for one particular trait of autism. Students with autism like to have routine and predictability and new situations will often cause them a great deal of anxiety. Providing a framework for reading that can be slowly built upon and can maintain some predictability may decrease the chances of anxiety or frustration levels.

Children with autism, however, also have difficulty with communication, theory of mind and often lack the opportunity to participate in the literate community (Kliewer, 1998). Top down methodologies provide these factors and a common method for teaching children with autism to read whole words and strings of words is to pair them with visual

images (Brown, 2002). Fad and Mouton (1999) state that when working with children with autism using a clear concrete visual system of communication helps minimize misunderstandings and frustrations. Many teachers will begin by presenting a simple phrase or sentence with the noun being replaced by a visual object or pairing the noun with its corresponding visual image (Brown, 2002). This method strengthens comprehension of strings of words and vocabulary of words by providing a mental image of reference.

Learning to read is not just dependent on reading instruction methodologies, it is also dependent upon the context in which instruction takes place. In choosing an environment for learners with autism it is important to take into account the sensory factors associated with the disorder. Students with autism can suffer from over stimulation with anyone of the senses depending on the child (Quill, 1995). It is important to examine the factors that may affect the child's visual, auditory and tactile senses and provide a comfortable and safe environment in which the child can concentrate and enjoy the process of learning to read (Brown, 2002).

Although there is no 'recipe' for supporting students with autism, Kliewer (1998) suggests that teachers 'reconceptualize the literate community'. Kluth and Latham, (2003) suggest that teachers recognize all literacy's from turning a page, listening to a story to learning sign language. They believe recognizing such abilities, skills and behaviours as literacy is especially critical when teaching children who struggle with traditional reading and writing activities. When teachers expand their understanding of literacy, they can

facilitate the development of a wide range of abilities and build on the skills that students do have. Students with autism often have interests that occupy their attention for long periods of time (Kluth and Latham, 2003). It has been suggested that these interests be used as part of the curriculum coupled with a wide range of visual supports.

Many people with autism have motor control problems that cause messy illegible handwriting. Word processors should be introduced early to encourage writing, as typing is often easier than handwriting (Grandin, 1995). In autism words that have no concrete visual meaning such as "put" or "on" need to be seen in written form in order to be heard and remembered (Park, 1967). Even highly verbal people with autism can often express themselves better using the written or typed word (Grandin, 1995).

Hyperlexia

Hyperlexia, the precocious self taught ability to read words with an apparent lack of comprehension, has played a role in the recently renewed interest in the literacy learning potential of people with autism (Mirenda and Erickson, 2000). Although hyperlxia appears in children with a wide range of disabilities, it appears to occur most often in children with autism (Cobrinik, 1974, 1982; Elliot and Needleman, 1976; Goldberg and Rothermel, 1984). Specific characteristic of hyperlexia include word reading skills that exceed what is predicted or expected based on cognitive and language abilities, compulsive or indiscriminate reading of words, onset of ability when the child is 2-5 years old and the onset of ability in the absence of direct instruction (Silberberg and Silberberg, 1967).

This precociousness with written words may be due to superior spatial abilities which are often noted in children with autism and this may therefore provide room for increased encoding and decoding abilities (Attwood, 1998). Further research suggests that hyperlexia may not stem from a problem with reading comprehension but from a problem with general receptive language coupled with strong word recognition skills (Snowling and Frith, 1980; Seymour and Evans, 1992).

2.5 Visual Learning

In chapter one the concept of mental imagery was introduced and the four types of mental imagery namely after images, eidetic imagery, memory/thought imagery and imagination discussed. One of the first people to relate memory performance to peoples learning styles was Bartlett (1932). He found that he could classify his subjects on the basis of their informal comments as either 'visual' learners or 'vocal' learners. The visualizers claimed to rely mainly on visual memory in remembering and the vocalizers claim to rely on language cues rather than mental imagers when remembering. In later years, Pavio (1979; 1986 in Eysenck and Keane, 1995) proposed a theory of Dual Coding whereby all mental representations retain some of the concrete, original qualities of the external experiences from which they derive. These experiences can be linguistic or nonlinguistic. Their differing characteristics develop two separate mental systems, one specializing in representing and processing language (a verbal system) and one for processing information about non linguistic objects and events (a non verbal system)

(Sadoski and Pavio, 1994). The latter is frequently referred to as the imagery system as it includes the generation and analysis of mental images derived from the senses (visual, auditory etc). These verbal and non verbal systems are separate but connected and can function independently or through a network of interconnections.

Mayer (1993) proposed a framework, derived from Pavio's Dual Coding Theory, for interpreting the cognitive processing of information that is presented both visually and verbally. As shown in Figure 1 this framework postulates the formation of three types of mental connections 1)visual material is used to mentally form a visual representation, thus forming a connection between the external visual material and the internal visual representation; 2)verbal material is used to form a verbal representation, thus forming a verbal representational connection; 3)the learner builds referential connections between the visual representation and verbal representation.

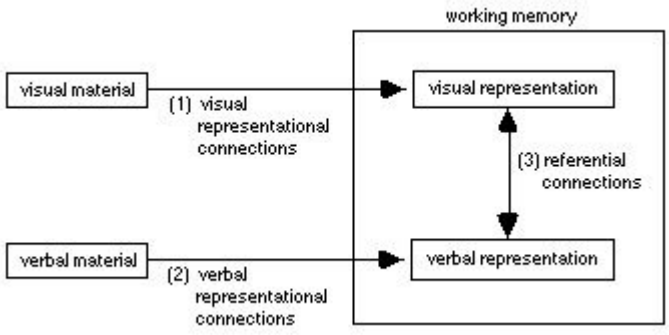


Figure 1: A dual coding theory of learning from visual and verbal materials (Mayer, 1993)

As mentioned previously, Luria (1973), through the examination and analysis of the cerebral organisation of complex human mental activity, found that complex mental functions such as perception, action, memory, speech and thinking makes use of a highly complex system of concertedly working zones and the brain is designed with modular systems compartmentalised by function. Research findings support this theory and indicate that verbal thought and visual thinking work via different brain systems (Farah, 1989; Zeki, 1992 in Grandin, 2000).

2.6 The usefulness of utilizing visual imagery to teach reading, writing and spelling abilities to children with autism.

It has long been documented that autistic individuals use visual modes of learning and thinking. This specific method of information processing was first documented by Hermilin and O'Connor (1970) who found that autistic children's ability to encode visuospatial information is superior to their processing of auditory information. Further evidence from intelligence testing revealed that children with autism performed best on tasks such as form discrimination, matching, block design, object assembly and pattern (Siegel, Minshew and Goldstein, 1996). Visual perceptual and visual spatial problem solving therefore appears to be a relative strength for children with autism (Zillmer and Spiers, 2001).

Many people with autism have problems remembering the sequence of a set of instructions (Quill, 1995). Children perform best with written instructions that they can

refer to, compared to verbal instructions or a demonstration of a task that requires remembering a sequence of steps (Boucher and Lewis, 1989).Hermilin and O'Connor (1970) found that the ability to encode and organize information was influenced by the amount of time the stimuli remained in place. When transient stimulus, such as verbal information, is presented, information is coded in a time dependent manner and the information fades rapidly as a function of time (Quill, 1995). With written words, however, the discriminations involved are of a spatial and not of a temporal nature (Quill, 1995). Consequently the integrity of the temporal processing mechanisms is not required. The non transient nature of the stimulus input eliminates sequential analysis and temporal processing requirements.

Temple Grandin (2000) believes that the greatest asset in her career as livestock equipment designer is her ability to think visually. She describes how she is able to visualize a video of the finished equipment in her mind and run test simulations of how the systems would work with different sized cattle. This study therefore proposed that this utilizing mental imagery and visually cued instruction mirrors the learning style strengths of children with autism.

2.7 Targeted Revisualization Program

The *Spelling, Imagery, Reading and Revisualisation Programme*, otherwise known as the Targeted Revisualisation Programme, conceptualises high mental imagery techniques as integral to the process of learning of the English language by children. This approach has

been conceptualised and refined by Professor Charles Potter, Educational and Research Psychologist from the Department of Psychology of the University of the Witwatersrand.

Targeted revisualisation assumes that, as hypothesised by Luria (1973), different types of memory related to each of the primary sensory modalities, as well as to their integration, exist. Learning to read and spell for example, requires a process of mediation of the form and structure of words. This would therefore involve the *development of multi-sensory association and integration of memories*, thereby enabling the child to reproduce words in their written form and to use language sequentially and in an integrated manner. To facilitate this, *a seven vowel system* (a; e; i; o; u; as well as y and w when in position at or near the end of words) instead of a 5 vowel system is taught to mediate the structure of the English orthography, making it more transparent to the child (Potter, 2000; 2001; 2003).

In light of this, specific words containing more than one vowel are targeted. Through reading sentences and passages, all words containing vowel digraphs and combinations as well as polysyllabic words are identified, forming the substrate for further analysis. These are then learned through dual coding/ multi-sensory processes involving colour coding of vowels and analysis of the word structure through syllabification. The correspondence between spoken and written forms of words is established, along with how vowel combinations represent sound structures. The association between language encountered in reading and language represented in writing is also mediated through the use of writing

and typing on the computer. Vowels and syllables are colour coded as an aid for word analysis (Potter, 2001; 2003).

Multi sensory teaching in this regard, therefore refers to learning activities that include the use of two or more sensory modalities simultaneously in order to take in or express information. Different sensory modalities are therefore used in combination by representing words explicitly, sequentially, directly and systematically, thereby aiding children who, in particular, experience phonological difficulties (Birsh, 1999; Moates & Farrell, 2000).

The targeted revisualisation approach closely follows the Piagetian understanding of the use of *perception and mental imagery*, viewing language and thought as separate yet concurrently developing systems utilised in the service of thought and forming integral parts of the learning process which serve as a basis for establishing reading and spelling competence. The literature on mental imagery suggests that while some children are able to use visual and eidetic imagery in this process, this is not characteristic of all children (Potter, 2001; 2003). In this regard, the programme utilises the term *visualisation* to imply that mental imagery is used in the learning of words. Likewise, the term *revisualisation* is used to imply that the image stored during visualisation is drawn out of memory before it is coded into output. Mental imagery is also used to revisualise the word, encoding it into oral and written output (Potter, 2000; 2001).

This high mental imagery approach therefore teaches the child to use perception, mental imagery and language in combination through a process referred to as '*targeted revisualisation*'. Single words are imaged and spelled orally, then revisualised and written. The development of sequential thought and memory is later emphasized though extension of this revisualisation process to sentences and paragraphs (Potter, 2000; 2001).

The Targeted Revisualisation programme consists of five different hierarchical levels, which initially follow the first two levels of the Phonic Inventories, moving thereafter onto polysyllabic words and morphological endings in the context of passages. Emphasis is placed on context throughout the programme, initially considering words in sentences in the lower levels and progressing thereafter to paragraphs in stories in the higher levels. Laddering and flexibility between levels, coupled with creativity, is advised in its implementation in order to allow for variety and to maintain the level of interest of the child (Potter, 2000).

Pre Reading Activities and Level One of the Targeted Revisualisation Program

This study focuses on the pre reading level and level one activities and principals of the Targeted Revisualisation Program and therefore levels two to five are beyond the scope of this investigation and will not be described within this research.

Level one of the programme assumes that a child has reached a level of reading readiness and in particular has established a level of phonological awareness. If the initial assessment indicates that this is not present focus will be placed on pre reading activities

involving oral language use, auditory and visual discrimination activities and visuo-motor activities. A series of logographic activities are also introduced to determine if the child can recognize a number of words and read them in sequence. The ability to recognize words from their shape and pattern is taken as an indicator that the child is ready to be formally taught and begin level one activities.

Level One of the programme purposes to establish the alphabetical principle in its application to the reading and writing of one syllable words containing short vowel sounds, individual consonants and consonant blends/clusters at the beginning and end of words. This is done through the utilization of word families which contain similar sounds/rhymes (e.g. a group of eight words ending with the letters /et/ as in *net* and *pet*) and word families which demonstrate a rule as applied to the writing of words containing single vowels (e.g. the letters *ll*, *ff* and *ss* are all doubled when following a short vowel, and the letters *ck* make the sound /k/ as in the word *kick*). Level One activities therefore focus on the establishment of the development of a system for analyzing and synthesizing consonants and short vowel sounds in words (Potter, 2000; 2001).

In the learning phase of this stage, the words are targeted, imaged and then verbally spelled from the image which has been formulated in the child's mind. The words are then revisualised and written by the child in their workbook, following which each level is tested through dictation, the errors made in which are also then subsequently mediated and targeted. To allow for the contextualisation of the words introduced in the programme and to facilitate the integration of the processes of language, perception, imagery and

cognition as involved in their use in written language, the child is also encouraged to write short sentences using other short vowel words in conjunction with the targeted words at this stage. The rules as related to word and sentence construction are also further reinforced through reading. The reading of books based on a phonic or linguistic system is therefore also introduced, through which the child becomes increasingly exposed to text which is comprised primarily of words which can be decoded through the application of phonic rules (Potter, 2000; 2001).

The aim of the programme at Level One therefore, is not only to target the rules involved in the construction of short vowel words, but also to introduce multi-sensory teaching methodology to the child. A low frequency of errors made on Level One of the Phonic Inventories by the child, indicates the consolidation of their ability with the tasks and the rules involved in utilizing words containing short vowels (Potter, 2000; 2001).

Colour Coding

Furthermore, *colour* is commonly known to be a powerful stimulus which aids children in learning through the captivation of their attention (Gattegno, 1963, in Sfetsios, 2002). The lack of one-to-one correspondence between phoneme to grapheme and the complications that result from this have been primarily responsible for the development of reading programmes that use colour to categorise the sounds and introduce new symbols to facilitate a more accurate correspondence between the phoneme and the spelling thereof (Walcutt et al, 1974, in Sfetsios, 2002). Research has shown that fewer trials are required for children to learn coloured letters when compared to those written in

black and white, with coloured letters aiding the initial learning in word recognition which is primarily a skill of a visual nature (Goodman & Cumdick, 1976). Gattegno (1963, in Sfetsios, 2002) found for example, that when testing the effects of colour of symbols on the learning rates thereof of both slow and average readers, colour coding initially enhanced the learning of the shape of letters in both the average and slow readers.

Computer Aided Learning

It has been proposed that the *computer* may play a vital role in helping children to acquire better basic reading skills and as such, is proving to be a particularly useful teaching aid for children suffering learning disorders. One of the areas of difficulty in which the learning disordered child struggles, includes the rapid and accurate decoding of individual words as discussed above, due to impaired phonological awareness and skills. In this regard, research conducted to date has shown computer aided training to be effective in improving the reading speed and accuracy of context free words and oral reading of text in children with learning disorders (Jones, Torgensen & Sexton, 1987). However, research conducted has shown the computer to be more effective in improving decoding skills than broad based comprehension skills. Computers have also been shown to be useful in providing large amounts of individualized practice which is reported to emphasis speed of response (Holland, 1980, in Jones, Torgensen & Sexton, 1987).

2.8 Principles of high imagery instruction

As has been highlighted throughout the above discussion and in the introductory chapters of this dissertation, the high mental imagery approach to remediation investigated in this study recognizes that poor readers and spellers typically struggle to learn to read and spell via phonological means due to their underlying *difficulties in phonological awareness*. The approach therefore emphasizes *multi-sensory* teaching, particularly through the use of *visual imagery* involving the process of *revisualization* to learn English words, as emphasized by Paivio's *dual coding model* (1971) and *Piaget (1960; Piaget & Inhelder, 1971)* who highlighted the close relationship that exists between imagery and language (Potter, 2003).

Decoding of words is utilised to facilitate the child's understanding of the construction of English language. Throughout the different hierarchical levels of the high imagery remedial approach, emphasis is also placed upon the utilisation of words being targeted in sentences and paragraphs, which are then also subsequently revisualised thus placing emphasis on the *context* in which words occur and thus up holding the main purpose of learning to read and write, which is to do so for meaning.

In addition, the *multi-sensory approach* to both reading and spelling, as highlighted by Luria, (1973) whose theory forms the basis upon which the high mental imagery approach to remediation has been developed, facilitates the integration of brain and neurological functions and of various mental skills and abilities which are all necessary to

coordinate to allow for skilled reading and fluent spelling and writing to occur, all of which are highly complex tasks to learn and to master, particularly for a learning disordered child.

Furthermore, the high imagery remedial approach recognizes that *every child is unique* and thus emphasizes the importance of ensuring that remediation is targeted specifically towards the child's own cognitive processing difficulties and weaknesses in their ability to utilize English orthography and allows for *flexibility* and adaptability to ensure that the child's needs in this regard are being met. Student-centered and led teaching is key to the programme, thereby encouraging the child to take responsible for their own learning process. *Colour coding* and decoding, as highlighted in the above discussion, also facilitates mental imagery and is in keeping with the multi sensory and flexible yet structured approach fundamental to the principles of high mental imagery remedial techniques (Potter, 2003).

2.9 Summary of Chapter.

This chapter explores the neurological underpinnings of autism and highlights the neural basis of language, communication and development. It also examines two neurodevelopmental models of autism namely the complex neurodevelopmental model of autism and The Cerebellum and Attentional Hypothesis. Reading, writing and spelling are defined and the development of these abilities is explored along with the predictors of reading development especially phonological awareness. Bottom up and top down

teaching strategies are explored along with comprehension and neuroimaging studies of reading development. Visual learning is explored along with the usefulness of utilizing visual imagery to teach reading, writing and spelling to children with autism. Finally The Targeted Revisualization Program is described along with the principals of high imagery instruction.

Chapter 3: Methodology

3.1 Sample

This study was an exploratory investigation into the use of mental imagery by autistic children through the implementation of a high imagery reading, writing and spelling program. It may pave the way for further research and more formal investigation by observing and providing an in depth analysis of a small sample of autistic children.

The sample size in this study was thus small consisting of three six year old children previously diagnosed with autism or autistic tendencies attending The Key School, a school for specialized education in Johannesburg, South Africa. The Key School specializes in teaching children with autism and other pervasive developmental disorders.

The researcher was first granted permission to conduct the research by the school headmistress and class teacher. The researcher then gained parental consent for those children selected to participate in the study. (See Appendix 2).

Specifically, the children chosen to participate in the study had all received a previous clinical diagnosis of autism or autistic tendencies. They were all 6 years of age at the onset of this study. They all attended the same class and all showed significant developmental delays in all areas. The design of this study was based on the assumption that each of the three children had had extensive diagnostic tests at time of intake into

their school programme. The purpose of this study was to attempt to build on this initial assessment, through a process of base-line observation, followed by intervention.

3.2 Research Design and Procedure

The research design used in this study can be classified as exploratory and pre-experimental. It is based on three case studies of children with autism, and uses an A-B-C design.

Condition A

The *establishment of a baseline of abilities* based on analysis of tests conducted at intake and observation. This stage included analysis of available data from each child's file as well as pre-testing using psycho-educational instruments. This information was combined with data from parent and teacher interviews, and a five month period of observation and recording of teaching done with the three children.

Initial interviews with both the teacher and the parents of each participant were conducted. Each participant's parent also completed a detailed biographical questionnaire pertaining to their child. Each participant's baseline of abilities was established using an information from the initial placement test battery, consisting psychological, language and perceptual assessments comprising educational and pediatric cognitive assessment tools, which shall be elaborated upon later within this chapter.

This information was then combined with data from additional tests of non-verbal abilities, verbal abilities, perceptual development, phonic abilities and reading, writing and spelling abilities. The process of pre-testing and establishment of baseline abilities was conducted in January 2005. The function of this was to provide a basis against which changes occurring both prior to and during the period of the intervention could be established.

A five month period of observation prior to the intervention then followed. During this time, samples of work from each child were collected and developmental diaries pertaining to each participant kept. This was done in order to establish and record any gains made each participant during a five month period of class instruction. After this five month observation period follow up interviews with the teacher and parents were conducted and all tests re-administered.

Condition B

A *five month period of high imagery instruction* then followed. This included the re-administration of various psycho-educational tests, follow up interviews of parents and teachers and the implementation of various high imagery activities using a framework provided by the Targeted Revisualisation Programme.

It was established that all the children participating in this study fell into word skill range level one of the Targeted Revisualisation Programme. They remained at level one for the duration of the program implementation period. Each child was thus tutored individually

using high imagery techniques based on the types of activities used in the Targeted Revisualisation Programme at level one, for one or two times per week depending on school attendance. The length of each session varied according to each child's individual abilities.

For recording progress, diaries consisting of the records of each session were kept for each child. This was done to enable an action research cycle to be followed, with observation and evaluation of work done in each session being used to plan and structure work done in subsequent sessions. The pre-reading and Level One stage of the Targeted Revisualization Program provided a framework for high imagery instruction implementation and through the application of action research principles (planning, action, observation, reflection). A variety of pre-reading and foundational instructional activities were then developed, which were implemented and documented. The nature of these activities, and the reaction of each of the three children to these, form the main focus of this study and will be discussed in later chapters.

Condition C

A *follow up of each child's progress* was conducted one year after the five month period of high imagery instruction.

A review of each child's school reports was conducted using the results from the school psychologist's reports, speech therapists reports and the class teacher's evaluation of each

child. This provided two sources of data for long-term evaluation of the progress made by each child against their base-line:

a. Work from pre and post-tests administered prior to and subsequent to the intervention.
b. Analysis of the cognitive, language and perceptual abilities of each child, conducted independently by the school psychologist and the therapists who worked with each child.

This was done in order to establish if the gains made during the period of high imagery instruction had been maintained.

Due to its exploratory, pre-experimental, multi-method and essentially qualitative nature, the analysis presented in this study is descriptive in nature, allowing for in-depth longitudinal within and between participant analysis of the children's' performance and progress. Comparisons were made between the baseline abilities and abilities following a five month period of high imagery instruction of each child and comparisons were also made between the children that participated in this study. This method allows the researcher to examine each individual case in greater detail and then to combine the results of individual cases to allow for in-depth between participant analyses and contrast (Banister et al, 1995; Lucas, 1974a; 1974b).

3.3 Framework of High Imagery Instruction provided by Targeted Revisualization Program

Table 1: Detailed description of stages and activities of level one of the Targeted Revisualization Program.

Activity	Description
1) Reading readiness assessment	In order to determine if each child has reached a level of readiness for reading a series of logographic activities designed to determine whether a child can recognize and visually discriminate a number of words, and read these in sequence was implemented. Between ten and twelve words were chosen that were familiar to the children. Words chosen included dog, cat, ball, plays, with, the girl, (each child's name), red, is looks, at. • Initially seven words were written on a piece of paper in front of the child and spoken several times. • They were then used as flash cards and read individually. • They were then placed on the table top and formed the basis of matching games. • They were then used in sequence to generate short sentences (The ball is red, The girl plays with the dog, Cat looks at the

	ball etc) • Sentences were read and matched with pictures representing characters in the target sentences. • They were pasted into each child's exercise book and formed the basis of a short story/reading book. • As the story/reading book was established the rest of the target words were introduced and additional sentences created and illustrated. The aim of this short logographic stage was to introduce the notion of reading words and sentences as well as representing the meaning of sentences and their component words in pictures. The ability to recognize words from their shape and pattern was taken as an indicator that the child is ready to be formally taught to read and spell, which formed the focus of the spelling, reading, imagery and revisualization program. If the child had established a level of readiness for reading they then moved into level one of the program. If however the above test showed that the child has not yet established a level of readiness for reading, level one activities were implemented in conjunction with a variety of exercises involving oral language usage, listening and discussion of illustrated stories. Auditory and visual discrimination

	activities were implemented along with activities aimed at developing phonological awareness, picture stories and visuo motor activities. Particular attention was paid to visually based activities as visually based activities and materials are a particular strength with autistic children and the basis of the program is teaching from strengths to weaknesses for each child. Auditory activities were supplemented with visual cues and non tangible, transient (audible) information was supplemented with concrete visual teaching materials.
2) Introducing letter/sound concept	Initially the sounds and letters were introduced using phono-visual principles. Focus was placed on the initial sounds of short words. These were introduced using flashcards and pictures: • Flashcards with single letters 'a' were matched to a picture of the corresponding sound "ant' and the actual word 'ant'. • The letter was traced and copied and additional short words corresponding to the letter\sound was introduced such as apple. For the children who had fine motor difficulties and were unable to trace and write without assistance a sentence builder was used and tracing and copying activities was done hand over hand. For the introduction of writing, a green dot was placed on each letter to show where the pencil should be placed to start and a small red arrow illustrating the direction

	in which the pencil should move in order to write the target letter. • The letters and corresponding words was then copied and typed on a computer. • Initially revisualization activities will aim at the revisualization of the target letter and then progressing to revisualization of three letter target words. The above activities involving sound letter matching were introduced as a process involving perception, imagery, language and cognition. This followed the principles of the Targeted Revisualization Program based on Piaget's suggestions that perception can be conceptualized as a process developed through activity, and imagery as a process developed through copying, with language and cognition being actively linked to both the perceptual and imagery processes. The process of introducing sounds and letters thus involved a multi-sensory method involving perception, imagery, language and cognition. The letter representing the initial sound of the targeted word being introduced was presented together with its accompanying picture. • After a few letters had been introduced using the above methodology, the pictures, letters and words were used as

	matching games and sorting games thereby learning the letter sound relationships both with and without the accompanying picture, developing three letter word skills, visual and auditory discrimination skills. At this stage the activities were aimed at developing a basic understanding of the alphabetic principle through a process involving perception, imagery, language and cognition.
3) Introducing short vowel words and word families	Following the Targeted Revisualization Program's principles, once the concept of learning letters, copying, writing and using the computer, as well as the imagery and revisualization of letters and target words had begun to be established, the next step was to develop a rule system for developing words of one syllable based on short vowel sounds. The words that were targeted were of one syllable involving the use of short vowel sounds and consonants and consonant blends/clusters at the beginning and end of words. This is done through the introduction of words as well as similar sounding (rhyming words) using different onsets and similar rhymes in word families. This is done via a multisensory technique involving a combination of visual, auditory, kinesthetic and tactile strategies

4) Words were discussed	
5) Written by teacher	
6) Copied and/or written by child	
7) Typed by child onto computer	
8) Short sentences containing words	
9) Sentences were typed	
10) Vowels were colour coded	Following the Targeted Revisualization Program's principles, the child was exposed to the way in which spoken words are represented in spoken language, with vowel sounds being made when the mouth opens and the consonants being made when the mouth closes. This was viewed and explained with the use of a mirror. Vowels were also placed on the side of a computer screen and matched to vowels appearing in words.
11) Imagery and revisualization	Words were thus targeted, imaged and spelled orally from the image in the mind. They were then revisualized and written in the child's book, through dictation. Errors were then mediated and targeted.

* For those children where writing is not possible, due to poor fine motor coordination, a sentence builder was used. A Sentence builder is a board with Velcro and laminated letters on it. The child can select the letters and arrange them on the Velcro to form words or short sentences.

3.4 Action Research

The principles of action research were applied in developing the programme for each child, in terms of which a cyclical process was used involving planning, implementation, observation and evaluation of each activity, as the basis for planning the next activity. The action research process was based on the work of Kurt Lewin in the 1940's (Banister et al, 1994). Lewin (1946) provided the argument that 'in order to gain insight into a process one must create a change and then observe the variable effects and new dynamics' (Banister et al, 1994).

Cohen and Manion (1994) have defined action research as 'small scale intervention in the functioning of the real world and a close examination of the effects of such intervention.' Action research aims to contribute both to the practical concerns of people in an immediate problematic situation and to further the goals of science simultaneously (Gilmore et al, 1986 in O'Brien, 1998). Action research allows for the focus to be placed on a specific problem in a specific setting. Emphasis is not so much placed on obtaining generalizable scientific knowledge as on precise knowledge for a particular situation and purpose (Cohen and Manion, 1994).

Kemmis (1988) distinguishes action research from more interpretive strategies by the concept of praxis, which can be defined as action informed by theoretical ideas and by the process of reflection on existing practice. Theory and reflection thus feed into formulation of new practice (Potter, 2002). The use of action research in the social sciences can be resolved into two stages: a diagnostic stage in which the problems are analyzed and hypothesis developed and a therapeutic stage in which the hypotheses are tested by a consciously directed change experiment (Cohen and Manion, 1994). It is suggested that the process of action research is continuous and evaluative in character, involving cycles of planning, implementation, observation and reflection. According to this view the outcomes of the research process involve changes of direction rather than an arrival at a destination (Potter, 2002) Similarly Stephen Kemmis has developed a simple model of the cyclical nature of the typical action research process (See figure 2).Each cycle has four steps: plan, act, observe and reflect.

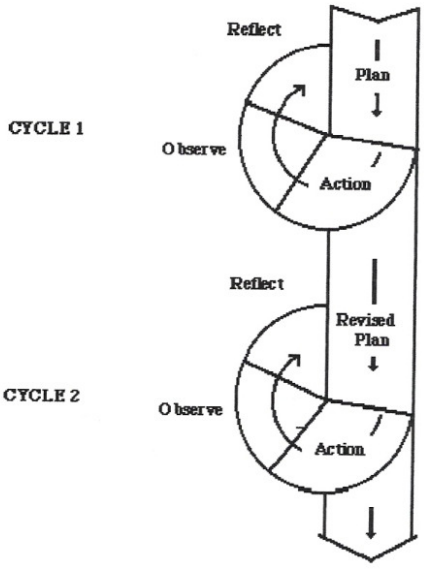


Figure 2: Typical Action Research Model proposed by Stephen Kemmis.

In this study action research allowed for problem solving within a specific context and provided the opportunity to develop theoretical knowledge with respect to implementing high imagery instructional techniques with autistic children. Action research was used essentially as an on-the-spot procedure designed to deal with a concrete problem located in an immediate situation. It was conceptualized as a step by step process that was constantly monitored over varying periods of time and by a variety of mechanisms (questionnaires, diaries, interviews and case studies) so that the ensuing feedback could be translated into modifications, adjustments, directional changes, redefinitions, as necessary, so as to bring about lasting benefit to the ongoing process itself (Cohen and Manion, 1994).

The principal justification for the use of action research in the context of a school is improvement of practice. It allows for flexibility and adaptability within the research framework. It relies chiefly on observation and behavioural data. Over the period of the project information is collected, shared, discussed, recorded, evaluated and acted upon (Cohen and Manion, 1994).

3.5 Instruments

In addition to the cognitive, language and perceptual tests applied at time of diagnosis of each child as having autism or autistic tendencies, and their placement in the Key School programme, each child was pre- and post-tested using the following battery of psycho-educational instruments:

- The Goodenough-Harris Draw a Person Test
- The Peabody Picture Language Vocabulary Test (Form L)
- The Perceptual Development School Readiness Assessment Device
- The Schonell One Word Spelling Test
- The Schonell Word Reading Scale
- The Schonell Graded Dictation Test (Form B)
- The Holborn Reading Scale
- The Phonic Inventories (Level One, Two and Three)

The Goodenough-Harris Draw a Person Test

This test involves the drawing of a person, a person of the opposite sex to the original drawing and a drawing of the individual. The method for determining a child's mental age and subsequently his IQ is based on the number of details included in his/her diagram. The test was administered at the outset of the study, prior to program implementation and again post program implementation.

The objectivity and reliability of the Goodenough scoring method for studying children's drawings have firmly been established. Its value as an index of intelligence is perhaps not quite so firm. Validity coefficients are uniformly positive but range from very modest (low 20's) to quite substantial (70's-80's) depending on the age of the subjects, age range of the sample and the measure used as the criterion (Harris, D.B 1963). Correlation

values show that the test measures intellectual factors more successfully than personality factors (Harris, D.B 1963).

The Peabody Picture Language Vocabulary Test.

This instrument is an achievement test designed to measure the extent of English vocabulary acquisition in children. It taps an important aspect of oral language, namely receptive vocabulary and has been used successfully with autistic persons. The test was administered at the outset of the study, prior to program implementation and again after program implementation.

The Perceptual Developmental School Readiness Assessment Device (P.D.A.D)

This instrument was a classroom school readiness rating scale developed by an optometrist, Selwyn Super, of Rand Afrikaans University in 1975. It was used to determine the children's level of perceptual development relative to school readiness. Levels of perceptual development were calculated for fine motor, gross motor, auditory motor and self image.

In Depth Interviews and Biographical Questionnaires.

Initial and follow up semi structured, open ended, in depth teacher and parental interview schedules were compiled by the researcher specifically for the purposes of this study. They were piloted and conducted with the parents and teachers in order to establish a base line of abilities (See appendix 3A and 3B respectively). The follow up interviews

with both the parents and teachers were conducted both prior to program implementation and post program implementation.(See Appendix 4A and 4B respectively).

A biographical questionnaire is a written biographical inventory completed by each participant's parent/s or legal guardian/s to allow for the gathering of additional information regarding each participant's developmental, medical, psychological and academic history to ensure that comprehensive background information is obtained to allow for in-depth and accurate case analyses (See appendix 5).

School records, speech and language therapy reports, occupational therapy reports, psychological reports and school progress reports were also incorporated in order to gain more information regarding the diagnosis, school history and progress of each child.

Developmental Diaries

An observational diary of each child's work was kept. Information was supplied by the class teacher and supplemented by the researcher. This included rich descriptions and examples of the child's work. It included a record of activities performed by the child. Parents of the children in the sample were also asked to keep diaries, with the aim of documenting progress made by the children in their home environment.

The Schonell Tests of Reading and Spelling

A) The Schonell One Word Spelling Test

B) The Schonell Word Reading Scale

C) The Schonell Graded Dictation Tests

The Schonell tests of reading and spelling are British tests developed by F.J Schonell and F.E. Schonell in 1942-1955 (Pumfrey, 1985). These tests form a battery for the assessment of reading attainment and for the diagnosis of aspects of failure in some of the mechanics of reading. The norms for the graded word reading test were revised in 1972 but the diagnostic tests do not include a number of aspects of reading now considered important eg auditory discrimination between words, matching written and heard forms of words (Pumfrey, 1985). The Schonell graded word reading test is one of the most widely used in the United Kingdom but have also been used extensively in South African schools, both with children with learning difficulties and children with normal scholastic development. The publishers issued new norms in 1972 based on 10 000 children aged from 6years 9months to 11years 9months attending a school in Salford. The norms were appropriately adjusted to have national validity (Pumfrey, 1985). Recently Eric Shearer, an educational psychologist working in Cheshire has administered the test to a nationally representative sample of 6 000 children aged from below five to eleven years attending Cheshire schools. He has been able to revise the order of difficulty of the words and to restandardise the norms for the test. Shearer claims that the new norms are remarkedly similar to those produced by Schonell over thirty years ago but are very different from those given in 1972. There is some controversy as to which set of norms has more general validity (Pumfrey, 1985). The Schonell Tests of Reading and Spelling were administered at the outset of the study, prior to program implementation and post program implementation.

The Holborn Reading Scale

The Holborn Reading Scale is a British test developed by A.F. Watts in 1948 (Pumfrey, 1985). The scale comprises thirty three sentences in increasing order of difficulty in terms of word recognition and comprehension. Each sentence represents a reading age three months higher than the preceding sentence. A child's mechanical reading ability can rapidly be assessed, but there are no norms for comprehension; hence the comparison between a child's mechanical reading and comprehension cannot be made as meaningfully as is suggested in the manual. There is no mention of reliability or validity in the manual. The norms are dated. This test has achieved popularity perhaps because of its ease of administration and the apparently simple interpretation of scores (Pumfrey, 1985). It also offers the possibility of comparing pupils oral reading and silent reading comprehension of the same sentence by answering related questions. The reading ages range from 6years 9 months to 13years 9 months. The Holborn Reading Scale was administered at the outset of the study, prior to program implementation and post program implementation.

The Phonic Inventories

The Phonic Inventories (see appendix x) were developed by Potter (2000; 2001; Potter, Grasko and Pereira, 2006) to allow for the identification of the phonic rules established by the child and to facilitate the correct diagnosis of the patterns of errors made in their written construction of English words. The inventories comprise of three levels designed to reflect different areas and levels of complexities in the process of learning to spell and read in English. Level one focuses on short vowels and consonant blends, level two on

long vowel and vowel digraphs and level three on root words, the doubling rule, morphological endings, polysyllabic words and compound words.

Each level of the Phonic Inventories has been found to yield reliability coefficients in the region of 0.90 (Pereira, 2007). Errors made on each level of the inventory are also diagnostic of learning disabilities (Grasko, 2005; Pereira, 2007). Owing to the link between reading and spelling as cognitive processes, reading experience is likely to mediate the child's performance on the Phonic Inventories (Grasko, 2005).

In administration of the inventories, beginning with Level One, the examiner reads each word aloud, then places the word in the context of a short sentence and, finally reads the word in isolation again, following which the child is required to write the word down with each subsequent word being written consecutively, in two columns, on a lined A 4 size page. Upon completion thereof, utilising the error analysis table provided, the spelt words are then analysed by the examiner for errors as related to initial consonants, initial blends/clusters, medial vowels, medial vowel diagraphs, ending consonants, ending blends/clusters, long and short vowel confusion, reversal/transposals, errors with prefixes, errors with suffixes and syllabification errors. Errors are then tallied according to type to determine their frequency.

This instrument was developed in cooperation with and based upon the sequence of instruction followed by primary school classroom teachers and as such, can be regarded as being content valid. Furthermore, the Phonic Inventories are criterion-referenced tests

(i.e. they are target specific and relate to particular developmental stages in the teaching of spelling, as opposed to being norm or group-referenced). Error analysis is incidental, as opposed to involving a system designed to yield specific information about the patterns of error made by individual children. Because of the specialized scoring of the Phonic Inventories, it is possible to know a child's spelling level as well as specific areas of difficulty that require attention or intervention. In this way, the Phonic Inventories move beyond traditional spelling assessment by directly accessing the level of phonological awareness and alphabetic knowledge attained by the child as well as the specific areas of difficulty (Grasko, 2005).

Within the South African context, a study by Potter, Grasko and Pereira (2006) explored the usefulness of the Phonic Inventories by comparing the error patterns made by mainstream and remedial primary school learners on all three levels of the instrument using a repeated measures ANOVA. It was found that both mainstream and remedial children made similar patterns of errors. A high prevalence particularly of errors in ending blends was apparent, and errors made in medial vowels, medial vowel digraphs, suffixes and syllabification were also common. What was also evident however was that remedial learners made consistently *more errors* on each category in levels One and Two of the Phonic Inventories. This would suggest that the Phonic Inventory Levels could be used for screening purposes in mainstream classes, with frequency of errors of the key error types for each level of the Phonic Inventories being used to identify at risk children. For Level Three, it is noteworthy that the actual patterns of errors made by remedial children looked very similar to that found for children in mainstream schools.

Furthermore, the mainstream children's performance improved notably as they moved up in grade, although this was not such for the remedial children, suggesting the Phonic Inventories may be tapping a persistent predictor of learning difficulties. A stepwise regression analysis was used to establish whether the relevant levels of the Phonic Inventories predict performance on contrast spelling tests. It was found that there was a good degree of fit between the tests, with the Phonic Inventories explaining between 69 and 77 percent of the variance of scores on these contrast tests. A discrimination analysis also showed that the Phonic Inventories predicts school affiliation to a fair degree. These findings therefore suggest that the Phonic Inventories is a valid spelling test for South African learners and has good potential to be used as a screening instrument to identify children with dyslexia.

Imagery Questionnaire

The Mental Imagery Questionnaire (see appendix xi) is a semi-structured self-report interview schedule developed by Potter (2000; 2001), based on the procedures described by Fernald (1943). The instrument focuses on the child's ability to use mental imagery in visualizing and revisualizing the form and structure of words. It has been used on a pilot study basis in a number of researches conducted to date through the Psychology Department of the University of the Witwatersrand investigating the usefulness of high mental imagery techniques in the remediation of English language disabilities (Abelheim, 2002; Els, 2003; George, 2001; MacReadie, 2001; Picton, 2002; Ravencroft, 2002; Sampson, 2002).

The Mental Imagery Questionnaire focuses in particular on visual imagery for words, and is useful in establishing whether children are able to use eidetic imagery (Jaensch, 1930; Fernald, 1943) in the process of learning and remembering written words. As words are based on a particular sequence of letters, the questionnaire also provides the researcher with insight into the nature and sequence of the imagery processes utilised by each child in remembering words, and whether the child is able to read, write and spell the words concerned (Potter, 2000; 2001). Evidence from additional sources [e.g. neurological correlates of the child's spoken and written output as shown on Positron Emission Tomography (PET imagery/scan) results] can then be used to substantiate the child's self-report on the imagery process.

It should be noted that mental imagery is an area of study which relies heavily on self-report, though the past twenty years have seen increasing use of psychometric as well as neuro-psychological indicators based on neuro-imaging techniques (Kolb & Whishaw, 1996; Rains, 2002; Zillmer & Spiers, 2001). The Imagery Questionnaire relies on self-report, but has the advantage of focusing on images of the form and structure of letters and words, which can then be checked against the child's ability to reproduce letters, sequences of letters and words in writing (Potter, 2002; Ravenscroft, 2007).

However, the psychometric properties of the Imagery Questionnaire have not yet been researched using neurological correlates. Studies conducted to date have established the potential of the instrument to yield substantive information on mental imagery in the process of learning the form and structure of words (Abelheim, 2002; Els, 2003, George,

2001; MacReadie, 2001; Picton, 2002; Potter, 2003; 2004; Ravenscroft, 2002; Sampson, 2002; Sfetsios, 2002), as well as to identify children who are able to use visual imagery in learning words and those who cannot.

3.6 Data Analysis

The analysis of the data in this study was conducted at two levels, both formatively and summatively.

In terms of formative evaluation, data collected within the sessions conducted with the children were analyzed and used within the action research cycle in order to guide future sessions and create modifications and adaptations to the high imagery instructional framework provided by the Targeted Revisualization Program.

In terms of summative evaluation, following post testing all data collected during the course of this study were then compiled, described and analyzed. Baseline, pre and post test raw scores obtained were tabulated and also compared to available norm and age related data. Qualitative data were analyzed by the researcher and utilized to inform the test scores obtained and to describe the nature of any progress made by each participant in their cognitive, reading, writing, spelling and mental imagery abilities over the intervention period (Barret, 1997). The background histories and qualitative and quantitative data gathered for the participants were compiled and the results obtained by each case discussed in detail.

3.7 Ethical Considerations:

The ethical research guidelines established by the committee for Research on Human Participants (Humanities) of the University of Witwatersrand were strictly adhered to in this study. Furthermore, prior to its commencement, this study obtained ethical approval from the University of the Witwatersrand Higher Degrees committee as well as the University of the Witwatersrand Department of Psychology Internal Ethics Board. Furthermore, this study also forms part of a larger group of studies investigating the efficacy of high mental imagery techniques for which consent from the Research on Human Participants Ethical Committee of the University of the Witwatersrand has been previously obtained. In addition, the parents/legal guardians of the participants were required to provide written informed consent to allow their child to participate in the study and to permit the researcher access to the academic, medical and psychological information contained in the child's school records (Appendix 2). Informed, written consent was also obtained from the school headmaster to utilize the school facilities and access it's learners for research purposes.

Confidentiality of the participants was strictly maintained and their anonymity assured in all documentation and reporting of study findings. Information directly related to the participants' involvement in the study was destroyed upon completion of the research, thereby ensuring that strict confidentiality and anonymity continues to be maintained (Barret, 1997). Participation in the research was also emphasized as being purely voluntary and their ability to withdraw from the study at any time without explanation or

negative consequence highlighted to the participants and their parents in the information sheet provided prior to the commencement of the study, see appendix 2. (Barret, 1997).

It was also ensured throughout the execution of this study that the participants were not harmed nor their school program or academic progress negatively interfered with as a result of their involvement in this research, which ran independently from the remedial primary school curriculum. Upon request, parents of the participants were allowed access to their child's pre and post test results, reflecting the progress made by the child, and the general trends found in the study upon completion thereof.

3.8 Summary of Chapter:

In this chapter, the methodology utilized to implement this research has been outlined. The qualitative and quantitative data gathering instruments including the psychological assessment battery utilized in pre and post testing, were then specified and discussed, showing how the resultant data collected through these measures and questionnaires would then be analyzed and the research questions addressed. The research questions in this study focus specifically on the participants' successive and simultaneous cognitive processing abilities as well as their skills in reading, spelling and writing and the nature and extent to which improvements were made in these areas following the intervention period, pending on the remedial technique utilized (high mental imagery versus phonological). Finally, ethical considerations taken into account in this study to ensure

confidentiality, anonymity and the well being of the participants at all times, were specified.

Chapter 4: Results

In this chapter the modifications and adaptations made to the framework for high imagery instruction, as provided by The Targeted Revisualization Program, through the implementation of the action research cycle will be documented. Following this the case studies including the background histories, baseline abilities and results from pre and post testing for each participant will be presented. Each participant will be identified by a letter in order to maintain confidentiality.

4.1 Using the high imagery framework of instruction as provided by The Targeted Revisualisation Program (refer to Table 1, Chapter 3)

The following programmatic structure was developed as part of the action research cycle discussed in chapter four. Through the process of planning, action, observation and reflection the following materials were found to be useful in implementing high imagery remediation.

Introduction of Sentence Builder

Due to the poor fine motor coordination of all three participants in the study a sentence builder was introduced.



Figure 3: Sentence Builder as utilized in this study

The sentence builder consisted of laminated letters attached by Velcro to a laminated card. The laminated letters were selected by the participants in this study and used to construct words and sentences. This was used to replace any written requirements of the participants in this study and was also used to conduct tests implemented in this study.

Inclusion of a variety of activities in order to improve reading readiness skills

Matching identical objects, pictures, letters and words were introduced as pre reading skills for those participants that did not succeed in the reading readiness assessment. These activities were aimed at improving each participant's visual discrimination while progressing through the developmental stages of understanding concrete objects, photographs, pictures and letters and words as highlighted by the National Grade R Adapted Curriculum. Additional activities aimed at improving fine motor coordination such as tracing and prewriting worksheets were also introduced. Auditory discrimination activities were also introduced.

Using picture representation when introducing short vowel words and word families.

In order to increase the vocabulary of the participants in the study pictorial representation of each word was used when introducing short vowel words and word families. This allowed for the development of a schema or mental representation of a concept. The written could therefore be associated with a picture representation of the word. An additional fine motor stage was also included in each child's programme at this stage whereby the participant had to trace the word before attempting to copy it on his own.

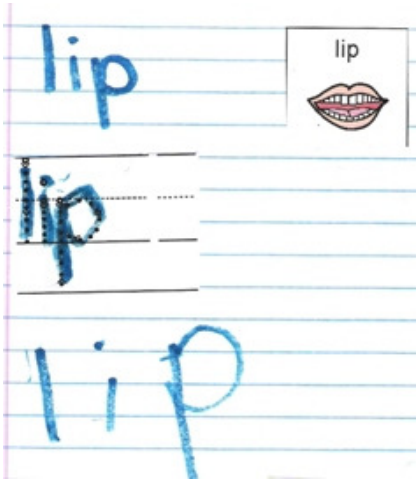


Figure 4: Example of additional representation included when introducing short vowel words and word families.

Vowels were visually presented on the side of the computer screen using Velcro

The children in this study found it difficult to understand the use of vowels within the English language. Attempts were made to explain the vowel as the physical opening of

the mouth when forming a word. This was demonstrated by the researcher using a mirror. The children were then asked to imitate the word and watch their mouth movement linking the opening of the mouth to the corresponding vowel sound. After multiple attempts at demonstrating this, the concept of the vowel remained intangible.

It was thus decided to teach to the relative strengths of the autistic learning strategy and use a visual means of representing the concept of the vowel. The five vowels "a,e,i,o,u" were printed and laminated. They were attached to the side of the computer screen using Velcro. When identifying and colour coding the vowels in a word Child Z used the vowels presented on the side of the computer screen as a visual cue. He had to match the vowel presented on the side of the computer screen to the vowel in the short vowel word, expressively label the letter and with the aid of the researcher colour code the vowel. This provided a visually based concrete means of introducing the vowel concept.

Short sentences containing words were first traced prior to be written independently by the participants.

An additional step was added in each child's program. Prior to copying sentences containing the short vowel words, each child was required to trace the sentence. This was done with the aim of improving fine motor coordination., and also to provide a multisensory basis for learning the structure of the words and of the sentence.

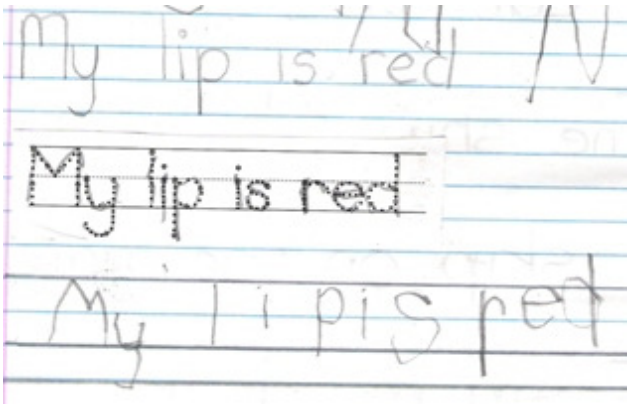


Figure 5: An additional tracing stage was added in order to aid improvement of handwriting skills.

Adaptations to the Imagery Questionnaire with one of the children

The imagery questionnaire proved too difficult to implement with Child Z. He was unable to understand the questions and respond accordingly. In order to investigate the use of mental imagery by child Z a simplified version of the questionnaire was implemented whereby a short vowel word was written on a page in large letters. Each letter in the word was written in a different colour for example **DOG** or **HAT.**

Child Z was then asked to:

1. Read the word, close his eyes and see the word in his mind.
2. He was asked to spell the word with his eyes closed
3. Identify the colour of the individual letters in the word.

Child Z was able to complete the above activity and correctly answer the above questions for a five consecutive three lettered short vowel words.

There were also many other adaptations which were made in the process of implementing the pre-reading and Level One stages of the Targeted Revisualization Program with these three children. These were documented as part of the action research process applied in each of the three case studies. In each, the program was used as a framework as opposed to a blueprint for developing a high imagery teaching program related to the learning level and needs of each child. In applying the framework, the principles of the targeted revisualization process at pre-reading and Level One stages were followed wherever possible, namely:

a. To focus the attention of the child on the structure of the printed and written letters and words.

b. To establish, on a meta-cognitive level, how the sound structure of language corresponds to the visual configuration of printed and written letters and words.

c. To use multisensory teaching techniques involving tracing, writing and copying activities, thus enabling the child to use perception and mental imagery in the process of learning and memorizing sound-letter relationships and their use in analyzing, speaking, reading and writing letters, words and sentences.

d. To use visual association as a means of coding from visual stimulus to auditory, and to use mental imagery as a means of ensuring that the child can link the visual configuration of letters and words with their auditory, verbal and phonological structure, as a way of establishing direct association between spoken language and its written form (Potter, 2006).

4.2 Child A: Results

4.2.1 Background Information

Child A was born on 18 June 1998. He was 6 years and 7 months at the beginning of this study. He was described as a slightly shy but enthusiastic little boy who was gaining confidence. His home language was English and lived with his mom and her boyfriend. He did see his dad frequently. He had an older sister who was 11 years old.

Child A was a planned pregnancy. His mom was 32 years old and his dad 42. There were no miscarriages prior to his birth and his mom did not have any difficulty falling pregnant. She reported that she was in good health throughout the pregnancy and she carried to full term. He was born via caesarean, the same as his sister was. Child A was 3.55kg when he was born and there were no complications during his birth. He was breastfed briefly while in hospital but was bottle fed when returning home. He struggled to suck the bottle initially. There were no problems introducing solids. Child A has had childhood chickenpox, a tonsillectomy and his adenoids removed. He does not have any recurring illnesses but has been diagnosed with epilepsy. He experience seizures and is taking Tegretol and Risperdal. He has been going to occupational therapy, physiotherapy and speech therapy since he was two years old. He has had all his vaccinations and has no allergies. He does however have coordination difficulties. He has also been diagnosed with Hypotonic Cerebral Palsy and Autism.

He has excellent family relations and is very attached to his family. He does have some emotional difficulties and can be unpredictable at times. He attends aftercare at his current school until his mom finishes work. He has an outgoing personality and has good relationships with his friends and siblings. He is reported having tantrums, can be attention seeking, is overly dependent and has unusual feeding habits.

Child A attended a Montessori school prior to his current school. Due to him not always achieving school goals he was unable to be promoted to the next class. He therefore has changed schools and now attends a special needs school specialising in autism. His main areas of difficulty are social adjustment and life skills. He has been attending speech therapy since June 2001.

Table 2: Child A: Developmental Milestones

Milestones	Age Achieved
First smile	1 month
Held head up first time	3-6 months
Sat unaided	18 months
Stood unaided	3 yrs
Crawled	Leopard crawled 18 months
Walked unaided	3 yrs
Began babbling	2yrs
First words	2 yrs
Sentences	4 yrs

Understanding and response to commands	2 yrs

As it can be seen from the above table, Child A displayed severe gross motor delays and speech delays. This was related to his poor muscle tone.

4.2.2 Child A: Baseline of Abilities

From the initial tests administered, Child A achieved a standard score of 51 on the Goodenough Harris Draw a Person Test and a verbal IQ of less than 59 on the Peabody Picture Vocabulary Test. His mental age was 2 years 5 months. His reading ability for the Holborn Reading Scale was less than 6 years 9 months. He achieved a raw score of zero on both the Schonell One Word Spelling and One Word Reading Tests, revealing a reading ability of less than 6 years. The Schonell Graded Dictation Test was deemed too difficult. He also achieved a raw score of zero on the Phonic Inventories for levels one, two and three (See table 3 for summary of results). A sentence builder was used to implement The Schonell One Spelling, One Word Reading, Schonell Graded Dictation Test and Phonic Inventories.

Perceptual Development Assesment Device subtest results reveal scores of gross motor 54%, fine motor 57%, auditory motor 42%, visual motor 38% and self image 38%. These are all well below the safe level of perceptual development for his age which is a score of 82.29%. See Figure 2 for summary of Child A's Perceptual Developmental Assessment Device results.

Initial interviews with his teacher reveal his aims within the class include behaviour management, increase independence and toilet training. He displays passively resistant behaviours which undermines his output. He is not currently involved in any formal reading program within the class but there is some informal introduction to phonics. He is unable to write his name and is weak within the fine motor area. Much of his time is spent on gross motor and perceptual activities. He is unable to spell any words. His teacher reports that his understanding of both spoken language and his use of spoken language is below what would be deemed age appropriate. His receptive understanding of language is however an area of strength. Both gross motor and fine motor activities are areas of weakness for him and his medication needs to carefully monitored.

In initial interviews with child A's mom reveal that there is a need for him to acquire more social skills. She reports that he is able to identify the alphabet and recognize a few words such as cat and dog. He is unable to copy and colour pictures at home but enjoys watching his sister. He cannot copy and write letters or words but can spell quite well at home. She reports that his understanding and use of spoken language is below is age level but he has a very good sense of humour. She feels his areas of strength include his ability to communicate verbally but this is also viewed as an area of difficulty with respect social skills and his ability to interact with others. She reports that he is progressing well within his school environment.

4.2.3 Child A; Pre Program Implementation test results and Results from Observation Period.

Child A shows no gains on the Goodenough Harris Draw a Person Test although his drawing is now of a male where previously no sex was given for his drawing. According to the Peabody Picture Vocabulary Test his verbal IQ remains below 59 but he has shown a three month gain in mental age (2 years 8 months). No change is seen on the Holborn Reading scale (less than 6 years 9 months), Schonell One Word Spelling (raw score, 0), Schonell One word Reading (raw score, 0) and the Schonell Graded Dictation is still deemed to difficult. The scores on the Phonic Inventories remain unchanged (raw score, 0 for levels one, two and three). A sentence builder was used to implement The Schonell One Spelling, One Word Reading, Schonell Graded Dictation Test and Phonic Inventories.

Scores for the Perceptual Development Assessment Device subtest results show an increase in gross motor abilities, 71% (a gain of 17%), visual abilities, 42% (a gain of 4%) and self image, 43% (a gain of 5%). There has however been a decrease in fine motor abilities, 43% (a decrease of 14%) and auditory motor remains unchanged, 42%. All subtest scores remain below the safe level of perceptual development, 86.46% for his age.

Teacher interviews, developmental diary results and school assessments show that a lot of emphasis has been placed on adjusting and refining Child A's medication. This resulted in

an initial personality change resulting in passively defiant behaviours, tantrums and non compliance. This decreased through the observation period and child A showed progress in many areas including life skills, toileting, physical and emotional development. He showed an increase in receptive and expressive speech. He continues to approach sight words limited to the names of the children in his class and is unable to recognize his surname. The word 'look' has been introduced in a book made for Child A relating to the class theme of clothes. He continues to be introduced to phonics informally through sounds like 't','t','t', for tuckshop etc. He is still unable to write his name and appears very weak in the area of fine motor skills. This is consistent with the results from the Perceptual Development Assessment Device. In class they have spent much time on gross motor activities, again consistent with Perceptual Development Assessment Device scores. He is still unable to spell any words. He has shown some improvement in his understanding of spoken language and is verbal and effective in his use of spoken language. Language remains an area of strength for him. Challenging behaviour along with toilet training has emerged as an area of weakness for child A and he would benefit from a home program.

Parental Interviews show that they have been doing basic life skills and the focus has been on personal hygiene. There has been a slight decrease in his interest in reading material but his reasoning ability appears to have improved following adjustments to his medication. He is reported to being able to recognize short words. There has been an improvement in his fine motor skills but he still has a palmar grasp when holding a pencil. He shows a limited ability to copy words and letters. He may have shown an

improvement in spelling. He has shown an improvement in his understanding of spoken language and he is now talking in sentences. This has also been reported by his speech and language therapist. His communication ability remains an area of strength for him and he is showing greater social understanding. His language is also an area of difficulty for him and he lacks the ability to delay gratification. It is felt that child A has matured a lot but requires routines which occasionally pose a problem. It is felt that because not much emphasis has been placed on literacy there has been a decrease in interest towards books. He is however beginning to show appropriate emotional responses to situations and has a well developed sense of humour.

4.2.4 Child A: Program Implementation and Post Program Results.

Level one activities were implemented with child A over a five month period. Sessions were conducted 1-4 times per week after school depending on child A's attendance to school. Sessions lasted from 15 minutes to 30 minutes depending on level of concentration.

Activities were aimed at developing the alphabetic principle and involved matching activities, tracing letters, identifying letters at the beginning of and within words, developing phonic awareness, matching pictures to appropriate letter sounds.

Progress was slow and due to Child A's short concentration span activities were brief. He also became easily tired and would often loose interest. Many of the tracing and copying

activities were done hand over hand due to poor fine motor coordination and poor pencil grip.

It was felt that there was some consolidation of the alphabetic principle and an increased awareness of phonics. Towards the end of the program implementation period sight words were introduced. Child A was unable to recognize words as a whole and would just identify letters within words. When asked to sight read the word 'cat' he would point out the 'c', 'a', 't' but was unable to put them together to sound out 'cat' or recognize word in its entirety.

Child A was unable to attain a level of reading readiness according to Macdonald's Reading Readiness Assessment whereby 10-12 words are sight read, recognized and used to form short sentences.

Child A again shows no gains on the Goodenough Harris Draw a Person Test with scores remaining at 51. According to the Peabody Picture Vocabulary Test his verbal IQ is now below 57 and has shown a three month decrease in mental age (2 years 4 months). No change is seen on the Holborn Reading scale (less than 6 years 9 months), Schonell One Word Spelling (raw score, 0), Schonell One word Reading (raw score, 0) and the Schonell Graded Dictation is still deemed to difficult. The scores on the Phonic Inventories also remain unchanged (raw score, 0 for levels one, two and three). A sentence builder was used to implement The Schonell One Spelling, One Word Reading, Schonell Graded Dictation Test and Phonic Inventories.

Scores for the Perceptual Development Assessment Device subtest results show an decrease in gross motor abilities, 63% (a reduction of 8%) and visual motor abilities 38% (a reduction of 4%). Self image, 43% and fine motor 43% remain unchanged. There was however an increase in auditory motor abilities, 50% (an increase of 8%). All subtest scores remain below the safe level of perceptual development, 83.75% for his age.

The imagery questionnaire was not conducted on Child A as Child A had not reached a point within level one activities whereby words were copied, colour coded and visualized.

Teacher Interviews, developmental diaries and school assessments reveal that Child A had a very disruptive period whereby there was sporadic attendance. It was felt that this resulted in regression in terms of babying and motivation. He showed little to no change within the classroom in terms of reading and pre-reading activities, spelling and use and awareness of phonics. It is felt that he responds to instructions better and he continues to communicate well. Language and literacy remain an area of strength for him although it was felt that there was not much progress made. His school attendance was felt to be an area of weakness. It again is felt that he would benefit from a home program.

Parental Interviews show that at home they have been focusing on some reading material sent home from the school. He is more focused on the reading material. It is also reported that he is identifying the letters within the word opposed to recognizing the word as a

whole. He is however able to identify a few words. He has shown improvement in terms of colouring and is using more appropriate colours. He is beginning to copy letters at home and will spell out words if you point to the letters. It is felt that there has been huge progress in his understanding of language and is combining new words to make sentences. It is felt that his ability to remember things is an area of strength for child A but his coping and life skills are an area of weakness.

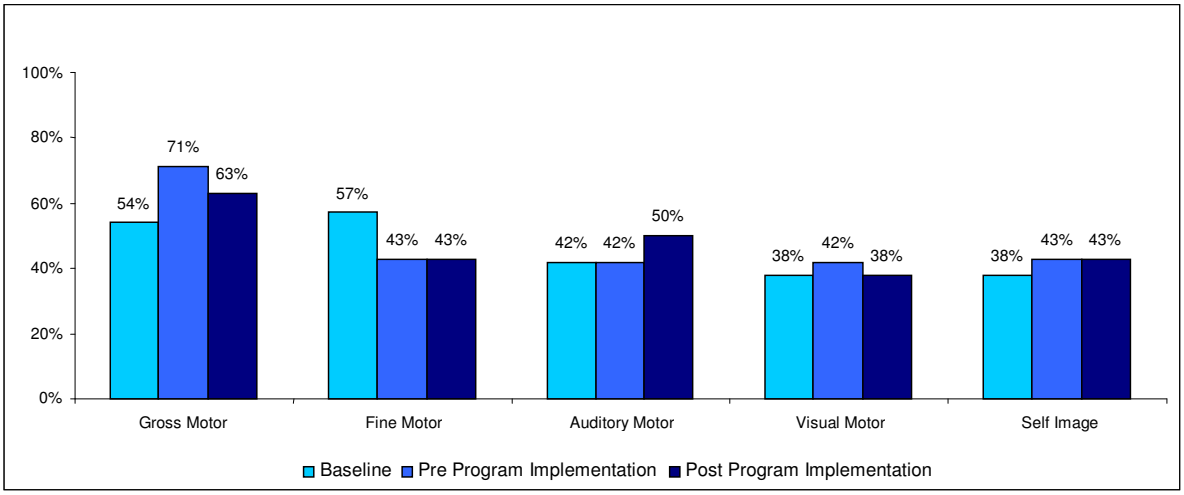
Vinelands test results obtained from the school's educational psychologist shows that Child A has an overall communication score of 2 years 8 months. Receptive communication is 3 years 11 months, expressive communication at 2 years 6 months and written communication at 1 year 6 months.

Table 3: Child A Summary of Results

Tests	**Baseline**	**Pre Program Implementation**	**Post Program Implementation**
Goodenough Harris Drawing Test	Drawing 1, no sex: Raw score: 0 St Score: 51 Drawing 2, no sex: Raw Score: 0 St Score: 51	Drawing 1, male: Raw score: 0 St Score: 51	Drawing 1, male: Raw score: 0 St Score: 51
Peabody Picture Vocabulary Test	Raw Score: 18 Mental age: 2y5m	Raw Score: 24 Mental Age: 2y8m	Raw Score: 17 Mental Age: 2y4m

	Verbal IQ: <59	Verbal IQ: <59	Verbal IQ: <57
Holborn Reading Scale	St Score: < 6y.09m	St Score: < 6y.09m	St Score: < 6y.09m
Phonic Inventories *Level One*	Raw score = 0	Raw score = 0	Raw score = 0
Phonic Inventories *Level Two*	Raw score = 0	Raw score = 0	Raw score = 0
Phonic Inventories *Level Three*	Raw score = 0	Raw score = 0	Raw score = 0
Schonell *One Word spelling*	Raw score = 0	Raw score = 0	Raw score = 0
Schonell *One Word Reading*	Raw score = 0 St Score: < 6y0m	Raw score = 0 St Score: < 6y0m	Raw score = 0 St Score: < 6y0m
Schonell *Graded Dictation*	>25 errors, test deemed too difficult	>25 errors, test deemed too difficult	>25 errors, test deemed too difficult

Figure 6: Child A Perceptual Development Assessment Device Results



Safe levels of Perceptual Development: Baseline (82.29%); Pre Program Implementation (88.54%); Post Program Implementation (93.75%)

4.2.5 Child A: One year post program follow up.

According to the Vinelands test results obtained from the school's educational psychologist Child A has an overall communication score of 2 years 11 months (3 month gain). Receptive communication remains at 3 years 11 months, expressive communication at 2 years 9 months (3 month gain) and written communication remains at 1 year 6 months. He scored at a 2 year 6 month level on the Peabody (2 month gain).

In terms of communication his class teacher reports that he communicates effectively and is able to express his needs. His vocabulary has appeared to increase and he now communicates in 3-5 word sentences. He has shown some improvement in terms of auditory perception.

In terms of perception and literacy his teacher reports that his matching skills are of high standards but he finds it difficult to recognize and label numbers and letters of the alphabet. He is able to recognize his own name and recognize class photos' of his peers. He needs support working from left to right.

4.3 Child K: Results

4.3.1 Child K: Background Information

Child K was described as a sweet natured boy who is helpful and polite. He is generally happy but is stubborn, resistant to change and often overreacts to situations. Child K lived with his mom and adoptive father. There has been no history of inherited diseases in both his immediate and extended family. There have however been reports of dyslexia.

Child K's mom did not have any difficulty falling pregnant with Child K and did not have any miscarriages. She was 27 years old and it was a planned pregnancy. She was in excellent health during her pregnancy and did not have any complications nor take any prescription drugs during the pregnancy. Labour was induced and lasted 6 hours. An emergency caesarean was performed due to fetal distress as the umbilical cord was wrapped around the baby's neck. Child K was 3.54kg when born. He was blue to the lack of oxygen and received oxygen for a brief period following the birth. He was breast fed for three months. Child K was reluctant to take solids and all foods had to be purified for two and a half years.

Child K has suffered no significant illnesses but was born with Abnormal Chromosome no. 5 and is classed as having a rare chromosomal disorder. (Cri du Chat Syndrome ("Cry of the cat" in French) is a genetic disorder caused by the loss or misplacement of genetic material from the fifth chromosome. It was first identified in 1963 by Professor Lejeune, who also identified the genetic cause of Downs Syndrome. He described the syndrome after the sound that many of the babies and young children make when crying. This cry, along with some of the other notable features, is so characteristic of the syndrome that a doctor can usually identify the condition before a chromosome analysis has taken place. As well as the physical features, Cri du Chat causes a varied level of mental handicap. There are a few children who attend mainstream education, but the majority of the children need more specialized education). He also had severe croup and has had several operations including bilateral hernias, tear ducts, tonsillectomy and grommets 7 times. He suffers from recurring ear nose and throat infections and chest infections. He has also been diagnosed with epilepsy and suffers from petite ma seizures. He currently takes epilim daily. He is up to date with all his vaccinations and does not have any allergies.

He does have some visual impairments namely Coloboma and he also has a squint. Coloboma is a congenital anomaly in which a portion of a structure of the eye is absent, usually the iris, retina and/or optic nerve. (The first 3 months of pregnancy is when the eyes develop at a quick rate. It starts as a small bud which then sprouts out and the inside of the eyes can be formed and nourished. When the development is complete, the gap is closed and a normal eye is there. In some cases however, the gap does not close or closes

only partially and these gaps will remain throughout life. This gap is Coloboma. There is no hole in the eye, but certain structures within the eye did not fully form). He also has autistic tendencies.

Child K has good family relationships and loves his siblings, a sister and brother. He has a very good relationship with his grandmother and grandfather. He does however find it difficult to accept change in his environment and the completion of certain activities and tasks. He perseverates and becomes very emotional often crying and shouting. He has a minder at home that cares for him as both his parents are working. He is described as a loving, enthusiastic child who is excitable and emotional. He is very affectionate. He is also in the process of learning how to make meaningful relationships. He does however sleep restlessly and is prone to tantrums. He also has a fear of the dark and at times can be overly dependent.

Child K attended two nursery groups prior to attending The Key School. He was subject to bullying and was often angry and unable to cope. His main areas of difficulty include behaviour processing information. Child K currently receives occupational therapy, speech therapy, physiotherapy and has an annual psychological assessment.

Table 4: Child K Developmental Milestones

Milestones	Age Achieved
First smile	4 weeks
Held head up first time	6 months

Sat unaided	12 months
Stood unaided	22 months
Crawled	18 months
Walked unaided	2 years
Began babbling	2 years
First words	2 years 6 months
Sentences	Still developing
Understanding and response to commands	2 years 6 months.

As it can be seen from the above table all of his developmental milestones were significantly delayed such as sitting, crawling, walking and first words.

4.3.2 Child K: Baseline of Abilities

From the initial tests administered, Child K achieved a standard score of 57 on the Goodenough Harris Draw a Person Test for his drawing of a male and a standard score of 58 for his drawing of a female. He achieved a verbal IQ of less than 59 on the Peabody Picture Vocabulary Test. His mental age was 2 years 10 months. His reading ability for the Holborn Reading Scale was less than 6years 9months. He achieved a raw score of zero on both the Schonell One Word Spelling and One Word Reading Tests, revealing a reading ability of less than 6 years. The Schonell Graded Dictation Test was deemed too difficult. He also achieved a raw score of zero on the Phonic Inventories for levels one, two and three (See table 5 for summary of results).

Perceptual Development Assessment Device subtest results reveal scores of gross motor 67%, fine motor 48%, auditory motor 42%, visual motor 46% and self image 52%. These are all well below the safe level of perceptual development for his age which is a score of 82.29% (See Figure 3).

Initial interviews with Child K's teacher reveal that he is participating actively in almost all areas of the class. Activities range from gross motor, language development, pre reading and writing skills, sounds of words, beginning sounds of words, beginning of peoples names and fine motor activities such as copying and tracing. She believes he has a lot of potential but this is hampered by his concentration ability. He is gaining an awareness of phonics and uses 't','t','t', for tuckshop and 's','s','s' for swimming etc. He does not try to write his name spontaneously but is busy copying and tracing circles. He has not yet done spelling within the class but will form part of a formal group following a more formal program when resources allow for it. He has a close to age appropriate understanding of language and shows and associative method of thinking. He uses language to trade and negotiate. His use of language is below age appropriate and he never uses prepositions. He uses intonation to convey meaning in his speech but expressive language is still an emerging skill. His understanding of receptive language, interest in books and thirst for stimulation are all areas of strength for him. His inability to delay gratification, perseveration and behaviour are area's of difficulty for him. Queries surrounding his visual ability limit some of the tasks he is asked to perform such

as colour identification. There also needs to be more alignment between school expectations and home.

Initial interviews with Child K's mom reveal that they are working on body parts at school and the focus is on reducing his perseverations. He is unable to identify and name letters but is able to identify some words and symbols such as Macdonalds and Pick and Pay. He does not copy and colour pictures at home but they are trying to work on writing his name. He is unable to spell any words and his understanding and use of spoken language is below expected age level. They do feel that he does have quite a large vocabulary. His memory, curiosity and outgoing personality are area's of strength for him but the processing of information is his biggest area of weakness.

4.3.3 Child K: Pre Program Implementation test results and Results from Observation Period.

Child K achieved a standard score of 51 on the Goodenough Harris Draw a Person Test for his drawing of a male and a score of 51 for his drawing of a female. This reflects a reduction of 7. His verbal IQ increased from 59 to 64 on the Peabody Picture Vocabulary Test. His mental age increased to 4 years 1 month. His reading ability for the Holborn Reading Scale was still less than 6years 9months. He again achieved a raw score of zero on both the Schonell One Word Spelling and One Word Reading Tests, revealing a reading ability of less than 6 years. The Schonell Graded Dictation Test was still deemed

too difficult. He also achieved a raw score of zero on the Phonic Inventories for levels one, two and three (See Table 5 for summary of results).

Perceptual Development Assessment Device subtest results reveal scores of gross motor 75% (an increase of 8%), fine motor 48% (no change), auditory motor 46% (an increase of 4%), visual motor 46% (unchanged) and self image 43% (a reduction of 9%). These remain well below the safe level of perceptual development for his age which is a score of 88.54%.

Teacher interviews, developmental diary results and school assessments show that Child K has a reasonably wide vocabulary and has a tendency to make associative relationships with objects. Aims include creating a structure around activities with a definite beginning and end. This is aimed at reducing his perseverations and tantrums when transitioning between activities. He is currently communicating in 2-3 word strings such as 'going bus', 'give love'. He made good progress in most areas and his home care giver spent time at the school in order to maximize carry over from school to home. He has developed a love for literacy and chooses looking at books consistently in free time in the class. He also received a book relating to the school themes that he is able to take home with him. Concerns surrounding his visual acuity, visual tracking and visual discrimination were raised. He is able to identify various pictures of objects and shapes etc but is unable to discriminate and identify colours. He seems to have made great progress in terms of pre writing and writing skills and is able to complete dot to dot exercises. He is unable to spell. There has been an enormous extension in his understanding of spoken language.

His receptive understanding of language has improved along with his listening skills, as reflected by his increased score on the Perceptual Development Assessment device. His love for books and literacy is an area of strength for him. Challenging behaviour remains an area of difficulty for him although visual schedules have been implemented.

No parental interviews were able to be conducted.

4.3.4 Child K: Program Implementation and Post Program Results.

Level one activities were implemented with child K over a five month period. Sessions were conducted 1-4 times per week after school depending on child A's attendance to school. Sessions lasted from 15 minutes to 30 minutes depending on level of concentration.

Activities were aimed at developing the alphabetic principle and involved matching activities, tracing letters, identifying letters at the beginning of and within words, developing phonic awareness, matching pictures to appropriate letter sounds.

There is some discrepancy surrounding Child K's visual ability. He was able to identify 2 dimensional pictures of various objects and people with ease. He was also able to match identical words and letters but only if there were two at a time on the desk. If there was more than 2 flashcards on the table he was unable to complete the task. He was able to recognize his name. He did not progress beyond matching as was unable to complete the

Macdonald's Reading Readiness Assessment as he could not match a word to a picture even after repeated instruction. Attempts to increase the size of the words and pictures were made but this had little influence on the results. His tracing was done hand over hand. It was felt that progress was made in terms of visually discriminating letters and words, little progress was made in terms of phonics and letter sound identification.

Child K showed no change in results on the Goodenough Harris Draw a person test from pre intervention testing to post program implementation. He only drew a figure of a male and received a standard score of 51. There was a decrease in his verbal IQ according to the Peabody Picture Vocabulary Tests from 65 to 61. His mental age also decreased to 2 years 9 months. His reading ability for the Holborn Reading Scale was still less than 6years 9months. He again achieved a raw score of zero on both the Schonell One Word Spelling and One Word Reading Tests, revealing a reading ability of less than 6 years. The Schonell Graded Dictation Test was still deemed too difficult. He also achieved a raw score of zero on the Phonic Inventories for levels one, two and three (See Table 2 for a summary of results).

Perceptual Development Assessment Device subtest results reveal scores of gross motor 79% (an increase of 4%), fine motor 48% (no change), auditory motor 42% (a decrease of 4%), visual motor 42% (a decrease of 4%) and self image 43% (unchanged). These remain well below the safe level of perceptual development for his age which is a score of 93.75%.

Teacher interviews, developmental diary results and school assessments also query what he is able to see. It is felt that at times he is able to see correctly and make accurate discriminations but at other times appears unable to do this. He does however show a love for reading material. He has shown an increased awareness of what is going on around him and there has been a further increase in his vocabulary. There has been an increased awareness of phonics but he is yet to use phonics spontaneously. He shows more mature writing and pre writing skills and greater endurance for a variety of tasks. He is still unable to spell. He has a good understanding of language and this includes an understanding of tone and volume. He shows a quicker response rate and appears to have a large vocabulary, occasionally using large abstract words in context. His tenacity and endurance are area's of strength for him and it is believed that this enable him to be included into a formal reading program. His inability to delay gratification, perseveration and trading or negotiating remain areas of weakness for Child K.

Parental Interviews reveal that at home and school they are consolidating work that has been done throughout the year. He is able to recognize his name, and has shown an improvement in his copying and colouring of pictures. He will attempt to copy and write letters and words at home but this is done hand over hand. He is still unable to spell. It is felt that there is a huge difference in terms of his understanding and use of spoken language. Again it is felt that his tenacity is an area of strength for him and his inability to delay gratification is an area of weakness.

The imagery questionnaire was not conducted on Child K as Child K had not reached a point within level one activities whereby words were copied, colour coded and visualized.

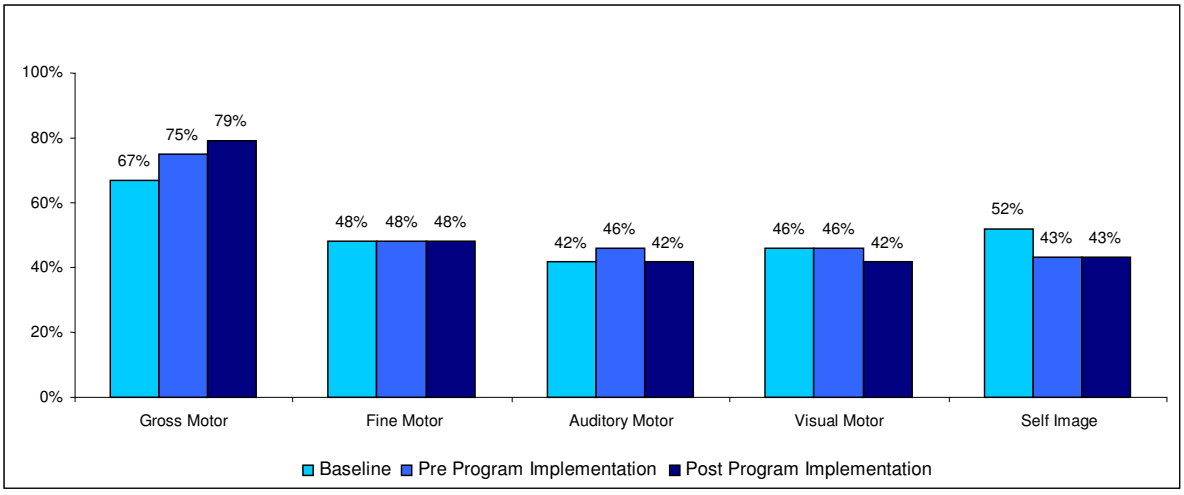
Vinelands test results from the School's educational psychologist show that Child K's communication ability is at a 2 year 7 month level with receptive language at a 2 year 11 month level, expressive language at a 2 year 4 month level and written language at a 3 year 7 month level.

Table 5: Child K summary of Results

Tests	**Baseline**	**Pre Program Implementation**	**Post Program Implementation**
Goodenough Harris Drawing Test	Drawing 1 male: Raw score: 3 St Score: 57 Drawing 2 female: Raw Score: 3 St Score: 58	Drawing 1 male Raw score: 0 St Score: 51 Drawing 1 female Raw score: 0 St Score: 51	Drawing 1 male Raw score: 0 St Score: 51
Peabody Picture Vocabulary Test	Raw Score: 27 Mental age: 2y10m Verbal IQ: <59	Raw Score: 43 Mental Age: 4y1m Verbal IQ: <65	Raw Score: 25 Mental Age: 2y9m Verbal IQ: <61
Holborn Reading Scale	St Score: < 6y.09m	St Score: < 6y.09m	St Score: < 6y.09m

Phonic Inventories *Level One*	Raw score = 0	Raw score = 0	Raw score = 0
Phonic Inventories *Level Two*	Raw score = 0	Raw score = 0	Raw score = 0
Phonic Inventories *Level Three*	Raw score = 0	Raw score = 0	Raw score = 0
Schonell *One Word spelling*	Raw score = 0	Raw score = 0	Raw score = 0
Schonell *One Word Reading*	Raw score = 0 St Score: < 6y0m	Raw score = 0 St Score: < 6y0m	Raw score = 0 St Score: < 6y0m
Schonell *Graded Dictation*	>25 errors, test deemed too difficult	>25 errors, test deemed too difficult	>25 errors, test deemed too difficult

Figure 7: Child K Perceptual Development Assessment Device Subtest Results



Safe levels of Perceptual Development: Baseline (82.29%); Pre Program Implementation (88.54%); Post Program Implementation (93.75%)

4.3.5 Child K: One year post program follow up.

According to the Vineland's test results obtained from the school's educational psychologist Child K still has an overall communication score of 2 years 7 months (no gain). Receptive communication remains at 3 years 11 months, expressive communication at 2 years 5 months (1 month gain) and written communication at 3 year 7 months (no gain). He scored at a 3 year 5 month level on the Peabody test (8 month gain).

In terms of communication his teacher reports he has shown great progress in following instructions but his understanding of language is still supported by visual cues and verbal repetition. He has shown a great increase and use of vocabulary and is now speaking in

two word sentences more often. Perceptually he still needs a little support with matching activities but has made excellent progress in tracing and dot to dot activities.

4.4 Child Z: Results

4.4.1 Child Z: Background Information

Child Z is described as a well mannered and good natured little boy who was born on the 4th August 1998. He was 6 years and 5 months at the onset of this study. His home language is Zulu and he attends an English medium special needs school specializing in autism. He currently lives with his father and step mom. He has no contact with his biological mother. There is no report of any inherited disorders within his immediate family. It is however reported that his father has a cousin who had severe learning difficulties and as a result of this dropped out of school after grade 4. He has an older step sister and step bother and reports getting along well with them.

Child Z's father reports his mom did not have any difficulty falling pregnant with Child Z and did not have any miscarriages prior to falling pregnant with Child Z. Both his mother and father were 26 years at the beginning of the pregnancy. It was a planned pregnancy and she was in good health throughout the pregnancy. She did not take any prescription drugs during the pregnancy and carried to full term. Her labour lasted 10 hours and had a normal birth. Child Z weighed 3.25kg at birth and there were no complications during or following the birth. He had mild jaundice and spent two extra days in hospital undergoing

phototherapy. Child Z was breast fed for nine months following the birth. There were no feeding problems nor difficulties experienced when introducing solid foods.

Child Z has had all his childhood vaccinations except for those due at 5 years. He has not had any recurrent illnesses but has had a tonsillectomy and adenonectomy. At 2 or 3 years old he had a serious fall and landed on his head. Child Z has been diagnosed with epilepsy and is currently taking Epilum under direction of his neurologist. He does appear to have some coordination difficulties and is currently receiving occupational and speech therapy on a regular basis at the school he is attending. He was diagnosed by a child psychiatrist at T.M.I. as autistic.

It is reported that Child Z has a close relationship with his family but has a tendency to have a short temper at times. He attends after care at the school he is attending. He is described by his parents as a bubbly but moody child. He is generally happy and is strong willed. He has recently started interacting with other children on the same level as them but his lack of speech proves to be a limitation in his relationships. He frequently has tantrums, is attention seeking and is overly dependent. He is also afraid of the dark.

Child Z attended a main stream nursery school but had difficulty adapting to the school environment. He was not properly stimulated there and was not receiving the appropriate attention to suit his special needs. His main areas of difficulty are speech, the understanding of instructions, communication and his language is still limited. He has been attending private speech therapy sessions for the past two years. He has shown a

vast improvement since joining his current school. He is now able to interact with his environment and he is more appropriately aware of what is happening around him.

Table 6: Child Z Developmental Milestones

Milestones	Age Achieved
First smile	6 weeks
Held head up first time	
Sat unaided	4 months
Stood unaided	8 months
Crawled	6 months
Walked unaided	10 months
Began babbling	14 months
First words	11 months but suddenly stopped
Sentences	Still does not use sentences
Understanding and response to commands	5 years but very limited understanding

From the above table it can be seen that on a gross motor level Child Z achieved all his developmental milestones. As commonly reported by parents with autism he had a few first words but these disappeared after a short period of time. He at present has a few words but does not communicate in full sentences. He also has limited understanding of instructions.

4.4.2 Child Z: Baseline of Abilities

From the initial tests administered, Child K achieved a standard score of 62 for his drawing of a male and 51 for his drawing of a female on the Goodenough Harris Draw a Person Test and a verbal IQ of less than 57 on the Peabody Picture Vocabulary Test. His mental age was 2 years 4 months. His reading ability for the Holborn Reading Scale was less than 6years 9months. He achieved a raw score of 3 the Schonell One Word Spelling test and a raw score of 11 on the One Word Reading Tests, revealing a reading ability of 6 years 7 months. The Schonell Graded Dictation Test was deemed too difficult. He also achieved a raw score of zero on the Phonic Inventories for levels one and three but achieved a raw score of 8 for level two (See table 6 for summary of results).

Perceptual Development Assessment Device subtest results reveal scores of gross motor 87%, fine motor 76%, auditory motor 67%, visual motor 79% and self image 52%. His score for gross motor is above his safe level of perceptual development (80.20%) and visual motor is only 1% below. Fine motor, auditory motor and self image scores are well below the safe level of perceptual development for his age (See figure 4).

Initial teacher interviews reveal that Child Z has a great interest in orthography, writing and phonics. He is able to read his name and the names of his class mates. He will spontaneously attempt to write letters and interpret what he is writing. He is a sponge and takes in everything you show him. He has moved on from letters by their uppercase name to identifying letters via their phonetic sound. His teacher has not yet explored his spelling ability. His understanding of spoken language is either on par or slightly below

expected age level but he lacks confidence when it comes to the use of spoken language. He is able to communicate in both Zulu and English. His desire for orthography is an area of strength. He displays emotional immaturity in comparison to his peers. His teacher is currently looking for a suitable reading scheme for Child Z.

Parental interviews reveal that in class they cover a new theme each week and he is able to recognize road signs. He is able to identify all the letters both capital and lowercase letters. He is able to recognize words such as Woolworths, Edgars and types of cars. He does not copy and colour pictures at home. Instead of writing himself it is reported that he encourages others to write for him, telling them what to write. His understanding and use of spoken language is below expected age level. His ability to recognize objects, writing skills and communication skills are areas of strength for him. Language is an area of weakness. He has responded well to his current school environment and his growth has been exponential.

4.4.3 Child Z: Pre Program Implementation test results and Results from Observation Period.

Child Z achieved a standard score of 77 for his drawing of a male (increase of 15) and 74 for his drawing of a female (increase of 23) on the Goodenough Harris Draw a Person Test. His verbal IQ increased from 57 to 59 on the Peabody Picture Vocabulary Test. His mental age increased to 2 years 8months (4 month increase). His reading ability for the Holborn Reading Scale was still less than 6 years 9 months. He achieved a raw score 4

(increase of 1) on the Schonell One Word Spelling Test and 11 (an increase of 4) on the One Word Reading Test, revealing a reading ability of 6 years 10 months (an increase of 3 months). The Schonell Graded Dictation Test was still deemed to difficult. He achieved a raw score of 12 (an increase of 12) on the Phonic Inventories level one, 7 (a decrease of 1) on level two and 0 (unchanged) on level three (See Table 6 for summary of results).

Perceptual Development Assessment Device subtest results reveal scores of gross motor 79% (a decrease of 8%), fine motor 90% (an increase of 14%), auditory motor 67% (unchanged), visual motor 87% (an increase of 8%) and self image 71% (an increase of 19%). These remain slightly below the safe level of perceptual development for his age which is a score of 91,67%.

Teacher interviews, developmental diary results and school assessments show that his vocabulary increases daily and there is an increased expectation in his standard of work. Pictures, orthography and phonics relating to the theme are sent home on a regular basis. Child Z displayed a thirst for knowledge and learns quickly. There was some discrepancy between home and school as he initially taught the alphabet and letters in uppercase at home and hence the uppercase sound for each letter while school was using phonics and lowercase letters. Child Z continues to struggle emotionally. It is felt he would benefit from a formal program and coping well with sight words. He has progressed from a passive non verbal child to a 'chatterbox'. He is also aware of and using the phonetic sound of words on a regular basis. He is making progress in the area of fine motor and is able to spell simple words such as cat, mat. This is done incidentally and not part of a

formal program. His understanding of spoken language has improved as well as his understanding of concepts. He is speaking in simple sentences. Language and memory are areas of strength for him but his emotional immaturity remains an area of weakness for him. He is a good candidate for inclusion and a formal program.

Parental interviews show that he is doing a lot of art, labeling and colouring. He has shown some improvement in identifying and naming letters and will recognize certain words in magazines or newspapers and read them out loud. He will also sound out the initial letter of words. He has his own colouring books at home and there has been some improvement in his pencil grip. He has also begun moving away from writing capital letters to writing lowercase letters. His understanding of spoken language has improved greatly and he is developing a concept of time and days of the week. He is initiating conversation more and is stringing words together at home to form three word sentences but does not use words like 'is and 'are' in sentences. He also does not use pronouns 'I', 'he' and 'she'. He on occasion gets confused between English and Zulu. It is also felt that his memory is an area of strength for him but communication and conversation are difficult areas for him. They would also like to see him partake in a more formal program in terms of reading and writing.

4.4.4 Child Z: Program Implementation and Post Program Results.

Level one activities were implemented with child K over a five month period. Sessions were conducted 1-4 times per week after school depending on child A's attendance to

school. Sessions lasted from 30 minutes to 45 minutes depending on level of concentration.

Activities were aimed at developing the alphabetic principle and initially involved matching activities, tracing letters, identifying letters at the beginning of and within words, developing phonic awareness, matching pictures to appropriate letter sounds.

Child Z was able to complete Macdonald's Reading Readiness Assessment whereby 10-12 words are sight read, recognized and used to form short sentences. This indicated that he had attained some level of reading readiness.

Child Z had already developed a keen interest in orthography and had been using a mixture of capital and lower case letters incidentally. He would ask adults to write for him due to poor fine motor skills and would spell out the words he wanted written. The initial sessions were aimed at consolidating phonics and the alphabetic principle and enhancing his use of letter sound relationships thereby moving him away from using capital letters and attempting to write in capital letters. He was able to trace letters independently but wrote words hand over hand. Child Z completed worksheets whereby he had to find specific letters within words which were accompanied with pictures. This also provided opportunities whereby Child Z could increase his vocabulary. He was provided with a photograph of the picture and the relating orthography. This provided opportunities for both a mental image of the word and object to be created. For example a worksheet pertaining to the letter C, contained words and pictures for the following: car,

crayons, dice and clock. He had to identify the letter C at the beginning of and within the words. Whole words were then rewritten.

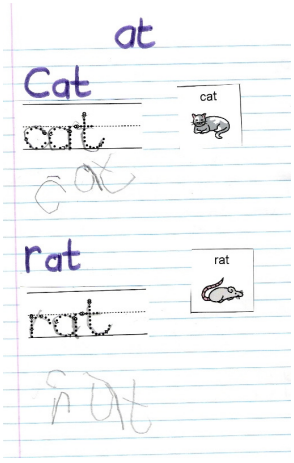
Sessions increased in length and the initials worksheets were supplemented with worksheets taken from Modern Curriculum Press, Phonics, Level A. Worksheets were again aimed at consolidating phonemic awareness, increasing vocabulary and providing opportunities whereby pictures were accompanied with the orthography in order for mental images of both to be formed.

Words that were introduced in the above worksheets were written underneath each other in a workbook produced by the researcher. The words were then typed onto a computer by Child Z. Vowels were colour coded. Vowels appeared to be an abstract concept to Child Z, who could not understand that vowels were the letters in the middle of words. Attempts were made to explain that vowels were formed when the mouth opened when saying a word. This was done using a mirror with Child Z saying words in front of the mirror and the researcher indicating the vowel sound and open mouth when he said the word. Child Z still appeared unable to understand vowels. The letters 'a', 'e', 'i', 'o', 'u' were then printed, laminated and stuck on the side of the computer with Velcro. Vowel identification then became a perceptual matching activity where the vowel in a word was matched to the vowel pasted on the side of the computer. The identified and selected vowel was then colour coded. Colour coded words were then read aloud by Child Z and spelt verbally. Child Z was then required to close his eyes, revisualize the word and spell it out loud with his eyes closed. Words were written by Child Z in his workbook alongside the identical word written by the researcher. Child Z was able to follow the

routine of completing worksheets, typing the words onto the computer, identifying and colour coding vowels, reading and spelling words, revisualize and spell words with eyes closed and copy words back into his workbook unaided. He appeared to enjoy the process and would introduce humour by purposefully saying the wrong letter and laughing.

Word families were introduced. Word families were limited to short vowel sounds. Words were written by the researcher and accompanied by a picture. Again this was aimed at proving an opportunity for a mental image of the orthography and picture to be formed. Words were then traced by child Z. The words were then typed onto the computer and the vowels matched as above and colour coded. Each word was then read and spelled aloud. Each word was reread. Child then was then instructed to close his eyes, picture the word in his mind and spell it out loud. He was able to complete all words successfully. He was then required to write the word unaided into his work book. (See Figure 8.)

Figure 8: Example of 'at' word family introduced with child Z



Words that had then been written by child Z were then used to form a short sentence such as 'The cat is on the bed'. The sentence was written by the researcher, traced by Child Z and lastly written unaided by Child Z.

For the Goodenough Harris Draw a Person Test, Child Z achieved 79 for his drawing of a male (an increase of 2) and a score of 68 for his drawing of a female (a decrease of 6). There was an increase in his verbal IQ according to the Peabody Picture Vocabulary Tests from 59 to 65. His mental age also increased to 4 years 1 months. His reading ability for the Holborn Reading Scale increased to 7 years 5 months (a gain of 8 months). He again achieved a raw score of 14 on the Schonell One Word Spelling Test (a gain of 10) and 20 on the One Word Reading Test, revealing a reading ability of 7 years 4 months (a gain of 6 months).

The Schonell Graded Dictation Test was still deemed too difficult. He did however make a good attempt to complete this test which also shows insight into his use and understanding of phonics. (See Table 7)

Table 7: Child Z's attempt to complete Schonell Graded Dictation Test and example of his use and application of the alphabetic principle.

Schonell Graded Dictation Test B	Child Z attempt.
I spent four days at a farm in the country. I had such a nice time because the people were so good to me. One night we set out	"I snt four days at u frm in the cntree. I hat sut u ntlos time decs the pwop wsa w good to me. One night wee sat out for a walk to

for a walk to the old church; before we had gone half way, however, it began to rain so we had to turn back.	the old clnbabtr." *(Test was discontinued at this point).*

He also achieved a raw score of 10 on the Phonic Inventories for level one (a decrease of 2), 20 for level two (an increase of 13) and 3 for level three (an increase of 3).

Perceptual Development Assesment Device subtest results reveal scores of gross motor 96% (an increase of 17%), fine motor 90% (no change), auditory motor 79% (an increase of 12%), visual motor 87% (no change) and self image 67% (a decrease of 4%). Apart from gross motor, all remain below the safe level of perceptual development for his age which is a score of 91.67%.

An attempt was made to conduct the imagery questionnaire with Child Z, but Child Z was unable to answer the questions. A simplified version of the imagery questionnaire was conducted by the researcher whereby a word was written by the researcher with each letter having a different colour for example Dog. Child Z had to read the word, close his eyes, spell the word and tell the researcher what colour each letter was in his mind. He was able to spell and describe each word presented accurately.

Vinelands results from the Schools educational psychologist show that Child Z's communication ability is at a 4 year 1 month level with receptive language at a 3 year 11

month level, expressive language at a 2 year 10 month level and written language at a 6 year 4 month level.

Teacher interviews, developmental diary results and school assessments show that Child Z has been given reading books with sore vocabulary. He is able to read them perfectly and has been given an extra list of words to read. It is felt though that he is memorizing words due to his strong visual capacity opposed to phonetically sounding out words. A multidisciplinary team to working on extending his reading ability and decreasing his reliance on visual acuity and visual memory. He is just soaring in terms of pre reading and reading abilities and is using phonics and sounding out words on a regular basis. Child Z has caught up a year in terms of writing and pre writing skills such as writing his name, colouring, holding the pencil and cutting. Not much spelling is done in class. He has made great strides in terms of understanding of spoken language and is now speaking in sentences and asking questions. His visual capacity, love for literacy and new found confidence are area's of strength for him yet his emotional immaturity remains an area of difficulty for him. He established a concept of time.

Parental Interviews show that he appears to be using phonics to read more at home and is now attempting to use letters within words to sound out words. He uses the books sent home from the school and once a word has been shown and said to him he never forgets it. His colouring has improved and he now stays within the lines and is beginning to shade correctly. He will also finish a picture before moving onto the next one. His understanding and use of spoken language has improved a lot and he is more verbal and

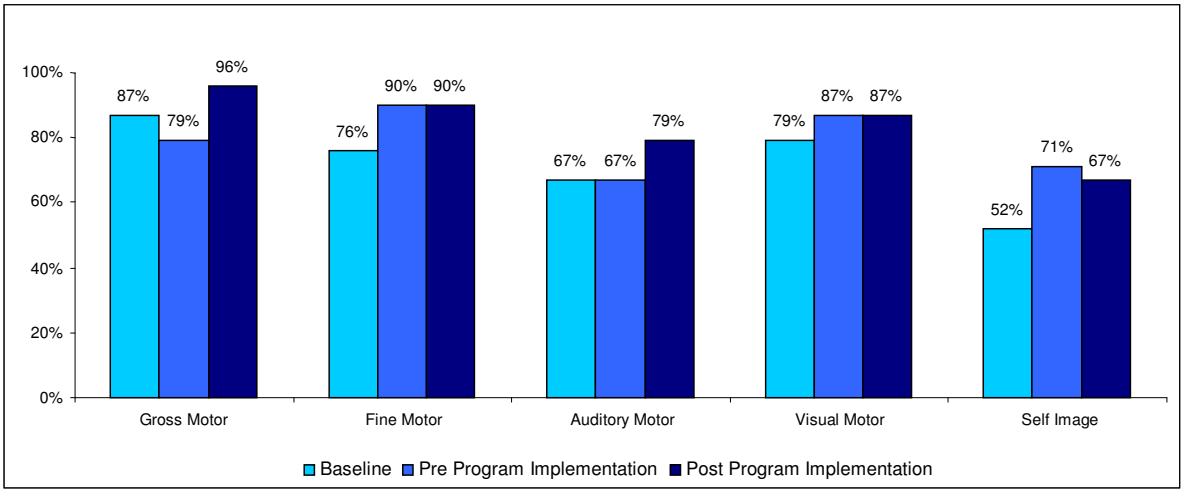
initiates conversation more. Again it is reported that his memory and ability to remember things is an area of strength for him. His emotional immaturity is also reported as being his area of weakness.

Table 8: Child Z Summary of Results

Tests	**Baseline**	**Pre Program Implementation**	**Post Program Implementation**
Good Enough Harris Drawing Test	Drawing 1 male: Raw score: 5 St Score: 62 Drawing 2, no sex: Raw Score: 0 St Score: 51	Drawing 1 male: Raw score: 12 St Score: 77 Drawing 2 female: Raw Score: 11 St Score: 74	Drawing 1 male: Raw score: 13 St Score: 79 Drawing 2 female: Raw Score: 8 St Score: 68
Peabody Picture Vocabulary Test	Raw Score: 17 Mental age: 2y4m Verbal IQ: <57	Raw Score: 24 Mental Age: 2y8m Verbal IQ: <59	Raw Score: 43 Mental Age: 4y1m Verbal IQ: <65
Holborn Reading Scale	St Score: < 6y.09m	St Score: < 6y.09m	St Score: 7y5m
Phonic Inventories *Level One*	Raw score = 0	Raw score = 12	Raw score = 10
Phonic	Raw score = 8	Raw score = 7	Raw score = 20

Inventories *Level Two*			
Phonic Inventories *Level Three*	Raw score = 0	Raw score = 0	Raw score = 3
Schonell *One Word Spelling*	Raw score = 3	Raw score = 4	Raw score = 14
Schonell *One Word Reading*	Raw score = 7 St Score: < 6y7m	Raw score = 11 St Score: < 6y10m	Raw score = 20 St Score: < 7y4m
Schonell *Graded Dictation*	>25 errors, test deemed to difficult	>25 errors, test deemed to difficult	

Figure 9: Child Z Perceptual Development Assessment Device Subtest Results



Safe levels of Perceptual Development: Baseline (82.20%); Pre Program Implementation (86.46%); Post Program Implementation (91.67%)

4.4.5 Child Z: One year post program follow up.

According to the Vinelands test results obtained from the school's educational psychologist Child Z has an overall communication score of 5 years 8 months (1year 7 month gain). Receptive communication remains at 3 years 11 months, expressive communication at 4 years 8 months (1 year 10 month gain) and written communication at 6 year 9 months (5 month gain). He scored at a 3 year 10 month level on the Peabody (3 month decrease).

His class teacher reports that in terms of communication Child Z has shown improvement in receptive language and now listens when others are speaking. He is able to follow simple instructions and complete verbal tasks. Expressively he participates confidently and fluently in a group. He can sing and recite simple songs and rhymes. In terms of literacy he is able to recognize and makes meaning of letters and words. He is able to recognize and name letters of the alphabet and has developed an awareness of phonics. He is currently experimenting with writing and makes good writing attempts.

4.5 Summary of Chapter

As it can be seen from the above chapter, all three children initially had phonological weaknesses, as evidenced by difficulties isolating onset sounds in words, difficulties with rhyming and difficulties in skills such as blending sounds into words.

Child K and Child A showed little to no response to the high imagery instruction, and continued to have difficulties with reading and pre-reading tasks involving working with the sound structure of the English language. A one year follow up shows that these two children continue to have difficulties with reading, pre reading and language activities.

Child Z showed an increase in phonological skills and in reading, writing and spelling abilities in response to high imagery instruction, as well as an increase in both vocabulary and the non-verbal abilities involved in drawing. A one year follow up shows that Child Z continues to progress well in the areas of reading and receptive and expressive communication.

Chapter 5: Discussion

As it can be seen from the previous chapter Child A and Child K showed little response to high imagery instruction techniques where as Child Z responded well and continues to progress in the areas of reading, writing and spelling.

5.1 Child A Discussion

During the five month period of high imagery instruction, Child A appeared to consolidate letter to sound relationships and grapheme to phoneme correspondences thereby entering the alphabetic strategy as described by Frith (1980). Child A however had some difficulty recognizing whole words and would only identify the individual letters within a word, for example Child A would be able to point to and label 'C, A, T' but was unable to recognize the word 'CAT'. It appears as if Child A was unable to form a lexicon of the whole word and utilize strategies used by early readers such as word shape to aid the identification of the word (Harris and Coltheart, 1986). Child A relied solely on the grapheme phoneme conversion or non lexical route in order to identify letters within the word but was unable to use these visual and auditory cues to sound out the word. The inability of Child A to identify the gestalt may be explained by the Cerebellum and Attention Hypothesis as described by Courchesne, 1995. In the Cerebellum and Attention Hypothesis attention is viewed as a critical deficit in autism. This may lead to stimulus over selectivity or over selective attention. Impaired attention results in increased

distraction and diminished cognitive functioning, because responses to irrelevant stimuli interfere with the processing of targeted information (Douglas and Peters, 1979; Lane and Pearson, 1982). Ornitz (1989) adds a motor component to these perceptual processes, enabling and modulating perceptual activity, for example visual scanning). Ornitz hypothesizes that autistic behaviour can be better understood as a disorder of directed attention involving neurophysiological mechanisms primarily, though not necessarily, in the right hemisphere. The use of the compensatory right hemisphere in reading disabled (RD) readers as described by Pugh et al (2001) may also reflect the inability of Child A to use linguistic information appropriately.

5.2 Child K Discussion

Throughout this study there has been much debate and discrepancy around Child K and his visual ability. Although able to discriminate between various pictures and objects he had some difficulty matching identical words and letters and did not develop grapheme to phoneme awareness. Child K is however able to identify some words and symbols such as "Pick and Pay" and "Macdonalds". According to Frith (1980), Child K remains in the logographic stage of reading acquisition where reading is based on the identification of salient features of familiar words and no value is given to letter order or identification within the words. According to the dual route processing model, child K remains in the sight vocabulary phase where he can read a small number of words via the direct or lexical method but unknown words cannot be read (Harris and Coltheart, 1986). It was reported however that Child K has a large vocabulary and is beginning to gain an

awareness of phonics and uses 't, t, t' for tuckshop and 's, s, s' for swimming. This may indicate that Child K may be utilizing auditory learning strategies to compensate for his potential visual difficulties in discriminating written words and letters. Child K may be described as a vocal learner, relying on language cues when remembering opposed to visual learners who rely on visual memory in remembering (Bartlett 1932). According to Paivio (1986), Child K may be utilizing the verbal system specializing in representing and processing language in order to form mental representations. This may explain why Child K did not respond well to a high imagery instruction program aimed at visual learners and enhancing the use of visual learning strategies.

5.3 Child Z Discussion

Child Z was described prior to his participation in this research as having 'good memory skills' and a keen interest in orthography and writing. He is also described as having strong gross motor and visual motor skills. Child Z responded well to all activities introduced during the period of high imagery instruction. He developed a sound grasp of the alphabetic principle and developed phonemic awareness. He was able to identify letters at the beginning, middle and end of three letter words and word families were introduced. The concept of the vowel was initially introduced via auditory explanations and showing child Z the mouth movement made by a vowel when pronouncing three letter words with short vowels. He was unable to grasp this concept and visual strategies were later introduced in order to explain the concept of the vowel. Vowels were then identified by child Z and colour coded on a computer. Child Z continued to progress and

was able to use revisualization strategies in order to store and retrieve learnt words. Towards the end of the period of high imagery instruction it was noted that child Z began employing more phonological strategies to sound out words thereby decreasing his reliance on visual memory and visual acuity. This transition is in accordance with Ehri (1994) whereby the initial stage of reading is the logographic stage where reading is visually based and relies on the visual contextual or graphic features to read words. The next two stages of reading according to Ehri is the transition from the logographic stage to the alphabetic stage and reflects the child's ability to start decoding words using letter sound relationships or phonemic awareness. Phonological awareness is believed to be the strongest and most stable predictor of reading ability (Shaywitz, 2003a, 2003b; Savage and Carless, 2004). This may prove true for Child Z who continues to succeed and develop in the areas of reading and language development.

In order to aid the comprehension ability of Child Z during the introduction of word families a picture of the word was introduced simultaneously. This was done in order for child Z to develop a schema for the word introduced that included a pictorial representation along with the orthography. This is in line with the schema theory perspective which views the mind as a highly complex set of cognitive structures and comprehension results from the organization, building and reorganization of information by the formation of schemata into which new information is incorporated (Ruddell and Unrau, 1994) This may at a later stage aid Child Z to organize and construct meaning from the text, thereby decreasing the potential development of hyperlexia which is

characterized by excellent decoding but poor comprehension abilities (Frith and Snowling 1986 in Broom, 2001).

When administering the imagery questionnaire it was found that Child Z was unable to comprehend what was expected of him. The phrase 'look at the word in your mind' may have been potentially an abstract concept for him. He did respond when the imagery questionnaire was simplified and presented in a more concrete and practical manner. This demonstrates a characteristic of language often associated with verbal children with autism, literalness. Literalness is the response to the literal meaning of information (Quill, 1997). It is therefore demonstrated that when assessing children with autism questions must be posed in a simple and literal form.

5.4 Research Questions

5.4.1) Can children with autism use mental imagery in developing memory and revisualization abilities with respect to printed words?

As it can be seen from the above results and discussion, mental imagery was only able to be used to develop memory and revisualization abilities with respect to printed words in child Z who was previously described as having strong visual memory skills prior to the introduction.

This may be due to the great cognitive and behavioural heterogeneity that can be found in the autistic population (Quill, 1995). As it can be seen from the above results, children with autism demonstrate different characteristics which often makes learning and teaching a difficult process. Teaching children with autism therefore requires that attention be paid to the unique social, behavioural and cognitive functioning of each child. Due to the positive gains made by child Z this may indicate that high imagery instructional methods may be suited to children with autism that are described as visual learners. As Child Z was able to successfully use the process of revisualization to learn words, this implies that he may be using mental imagery, specifically visual and eidetic imagery, to learn to read, spell and write. Child A and Child K were possibly unable to achieve equal success using a high imagery instructional program as they may not be employing visual strategies to learn.

5.4.2) Is there improvement in the cognitive, language and scholastic functioning of three six year old autistic children after being exposed to high imagery instruction as indicated by:

a) *Change in the human figure drawing (DAP) scores of these children?*
b) *Change in the vocabulary scores of these children?*
c) *Improvements in the reading, writing and spelling abilities of these children?*

Child Z was the only child in this study that showed positive changes in the human figure drawing (DAP) scores, vocabulary scores and reading, writing and spelling abilities. This

may be due to Child Z being the only child in this sample described has having strong visual memory skills and the high imagery instructional program being suited to his learning and cognitive style.

The improved vocabulary scores achieved by Child Z may be due to Child Z's improved reading skills. Child Z may be using a series of visual cues and associations provided through written text in order to organize and share information. It may be possible that Child Z is using his visual thinking systems to expand and compensate for his deficits in language. This is in accordance with Luria's (1973) work, where through the examination and analysis of cerebral organization of complex human activity he found that complex mental functions such as perception, action, memory, speech and thinking make use of a highly complex system of concertedly working zones.

Chapter 6: Conclusion, Limitations and Suggestions for Further Research

6.1 Conclusions

Child A and child K in comparison to Child Z , showed little response to the introduction of a high imagery instruction program as indicated through cognitive, language and scholastic functioning. Child Z who was previously described as having strong visual memory skills responded well to the introduction of a high imagery instructional program.

It is evident that children with autism will benefit from both bottom up and top down styles of teaching reading. Bottom up strategies appeal to children with autism as they provide concrete rules and structure for learning phonics and developing phonemic awareness. Top down strategies provide the opportunity to develop schema for classifying and constructing meaning from text thereby aiding comprehension and potentially improving language.

As can be seen from the results obtained in this study, high imagery instruction may suit those children with autism who have strong visual memory skills and those described as visual learners. As demonstrated by Child Z, it is possible for children with autism to use

mental imagery as a tool for learning and remembering. As seen from the results obtained Child Z was able to use visual and eidetic imagery in the learning of words but this was not demonstrated by Child A not Child K. It is evident however that this program may not suit all learners with autism and that a reading program intended for all learners with autism will have to have large degree of flexibility in order to accommodate the different cognitive abilities and learning styles of this unique population.

6.2 Limitations

Due to the small sample size (n = 3) and the nature of exploratory, pre-experimental case study research, this research may have high social significance. It does however lack scientific vigilance and rigour therefore it's wider significance and the generalizability of results is significantly limited.

6.2.1 Threats to internal validity include maturation, testing and history.

Due to the longitudinal nature of this research (five month observation period, five month program implementation period and one year follow up) there may have been confounding variables unrelated to the study which may have impacted on the results obtained, these may include physical, psychological and educational maturation which would have occurred in any rate regardless of the five month period of high imagery

instruction. It also cannot be determined that the gains made by Child Z would not have occurred if the period of high imagery instruction was not implemented.

The psycho-educational tests and interviews were administered three times during the duration of this research. This may affect the results from the testing and the interviews due to familiarity of the test and interview format and procedure. The gains made by each child in this research and results from both parent and teacher interviews may be attributed to the effects of repeated testing and follow up interviews.

History refers to the environmental events other than the independent variable which occur over the period of investigation which may possibly influence the results of the subjects in the study. In this research history may refer to the possible educational interventions which may have occurred simultaneously (such as class interventions and speech therapy) during the period of high imagery instruction. It may also include any changes to medication received by the children during this investigation or alternate therapies received by the children outside of the school environment.

6.2.2 Threats to external validity include sample bias, population and ecological validity.

Due to the small sample size and the selection criteria for which the children were selected for this research, the sample does not reflect the whole population being

investigated, namely children with autism. The sample bias occurs as all children were in the same class attending the same school. This significantly restricts the inferences that can be drawn from this study influencing both the population and ecological validity of this study.

6.3 Suggestions for further research

It is suggested that future research explores the potential use of high imagery instruction for children with autism who are described as visual learners on a more formal basis. This may include increasing the sample size, conducting the research across various schools and classes and possibly matching individuals in the sample in order to have a control group.

Further suggestions include neuroimaging studies of children with autism both visual and non visual learners while reading in order to examine the neurological underpinnings of the reading process by children with autism.

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Appendices:

Appendix 1: DSM-IV-TR Diagnostic Criteria for Autism

The following criterion is from the 2000 Revision of the Diagnostic and Statistical Manual, Fourth Edition, Text Revision (DSM-IV-TR). See the DSM-IV-TR manual for details and examples.

A. A total of Six (or more) items from (1), (2), and (3), with at least two from (1), and one each from (2) and (3).

1. qualitative impairment in social interaction, as manifested by at least two of the following:
    a. marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction
    b. failure to develop peer relationships appropriate to development level
    c. a lack of spontaneous seeking to share enjoyment, interest, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest)
    d. lack of social or emotional reciprocity

2. qualitative impairments in communication as manifested by at least one of the following:
    a. delay in, or total lack of, the development of spoken language (not accompanied by an attempt to compensate through alterative modes of communication such as gesture or mine)
    b. in individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others
    c. stereotyped and repetitive use of language or idiosyncratic language
    d. lack of varied, spontaneous make-believe play or social imitative play appropriate to developmental level

3. restricted repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:
    a. encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus
    b. apparently inflexible adherence to specific, nonfunctional routines or rituals
    c. stereotypes and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements)
    d. persistent preoccupation with parts of objects

B. Delays or abnormal functioning in at least one of the following areas, with onset prior to age 3 years: (1) social interaction, (2) language as used in social communication, or (3) symbolic or imaginative play.

C. The disturbance is not better accounted for by Rett's Disorder or Childhood Disintegrative Disorder

Appendix 2: **PARENT INFORMATION AND CONSENT FORM**

Dear Parent/Guardian

My name is Tracy Hadfield. I am studying for a Masters Degree in Research Psychology and in partial fulfilment of my degree I need to carry out a research project. The aim of my study is to investigate the use of mental imagery as a learning technique by autistic children and to investigate the use of a high imagery reading, writing and spelling programme (The Targeted Revisualisation Programme) as a possible remedial tool for children with autism.

Your child is invited to participate in this study. Should you give consent for your child to participate in this study their work at school will be observed for a period of approximately six months in order to establish a baseline of their reading, writing and spelling abilities. After this initial observation period they will receive one or two hours a week of individual tuition using the high imagery remedial reading, writing and spelling programme for a period of six months. Tuition will be conducted by myself at your convenience. Your child does not need to remain at the Key School in order to receive tuition and take part within this study. Some of your child's drawings will be used to determine his/her mental age and IQ. Various reading and spelling tests will be used in order to determine and record any progress made before and after the introduction of the Targeted Revisualisation Programme. A vocabulary test will also be used before and after the introduction of the remedial programme. After the six month period of high imagery

remedial instruction an imagery questionnaire will be administered to examine the use of mental imagery by your child in the learning process. Any data collected and test results will remain **confidential** with only myself knowing the identity of your child**.**

I will also conduct an initial interview with your child's class teacher and keep a developmental diary of your child's work throughout the duration of the study. I will also conduct an initial interview with yourself and will also ask you to keep a developmental diary noting your own impressions of any progress made by your child. Any work done within the tuition sessions will also be recorded. Follow up interviews with yourself and your child's teacher will be conducted on a regular basis.

Participation in this research is entirely **voluntary** and if you wish you child to no longer participate he/she may withdraw at any time. **Non-participation** will have **no negative consequences** and will in no way impact on your child's academic record. If you agree for your child to participate, please sign the permission slip below.

If you would like to contact me with any queries you may have, please feel free to call me on 0834881808.

Thank you for your time.

Tracy Hadfield

I, _____ consent to my child's participation

in the research study to be conducted by Tracy Hadfield

Appendix 3A: **Initial Interview-Parent**

Thank you for giving permission for (Child's name) to participate in my study. In order me to develop a baseline of (Child's name) abilities I need to ask you a few questions regarding how you feel (Child's name) is progressing within his/her class.

1) What work is (Child's name) currently doing within the classroom?

2) Is (Child's name) able to identify and name the letters of the alphabet?

3) Can (Child's name) recognise written words?

4) Does (Child's name) copy and colour pictures at home?

5.1) Is (Child's name) able to copy and write the letters of the alphabet?

5.2) Can your child write words?

6) Is (Child's name) able to spell any words?

7) How would you describe (Child's name) understanding of spoken language?

Below expected age level	Age Appropriate	Above expected age level

8) How would you describe (Child's name) use of spoken language?

Below expected age level	Age Appropriate	Above expected age level

9) What are (Child's name) areas of strength?

10) What are (Child's name) areas of difficulty?

11) Is there any other information about (Child's name) that you would like to share with me?

Thank you for taking the time to meet with me and answer the questions about (Child's name). I would like to meet on a regular basis in order to follow up on (Child's name) progress in the areas of language use and understanding, reading, writing and spelling. This will be done at your convenience either face to face or telephonically.

Appendix 3B: **Initial Interview - Teacher**

(Child's name) parents have given permission for (Child's name) to participate in a study that examines the strategies used to accommodate visual learning in three children with autism. The implementation of this study will in no way interrupt or impact the work that is currently being done in your classroom. The following questions aim to enable me to gain insight into the work that (Child's name) is currently doing in your classroom and what visual strategies are being used to accommodate (Child's name) learners.

1) What work is (Child's name) currently doing within the classroom?

2) At what level (low/high) is (Childs name) currently functioning?

3) Please describe (Child's name) current level of scholastic abilities.

4) To what degree has visual instruction formed apart of the daily school routine?

5) What visual strategies are being implemented?

6) Who decides what visual strategies to use?

7) Are teaching strategies individualized? If so who and how is this determined?

8) How would you describe (Child's name) understanding of spoken language?

Below expected age level	Age Appropriate	Above expected age level

9) How would you describe (Child's name) use of spoken language?

Below expected age level	Age Appropriate	Above expected age level

10) What are (Child's name) areas of strength?

11) What are (Child's name) areas of difficulty?

12) Is there any other information about (Child's name) that you would like to share with me?

Thank you for taking the time to meet with me and answer the questions about (Child's name) current work in the classroom. I would like to meet on a regular basis in order to follow up on (Child's name) progress in the areas of responding to visual instruction. This will be done at your convenience either face to face or telephonically.

Appendix 4A **Follow up Interview-Parent**

Thank you for meeting with me again. I have a few questions that will enable me to gain insight into the work done and progress made by (Child's name) since our last meeting.

1) What work is (Child's name) currently doing within the classroom?

2) Have you notice any change in (Child's name) ability to identify and name letters?

3) Has there been any progress (Child's name) ability to recognise written words?

4) How is (Child's name) copying and colouring of pictures at home progressing?

5) Have you noticed any change in (Child's name) ability to copy and write letters or words at home?

6) Can (Child's name) able to spell any (new) words?

7) Has there been any change in (Child's name) understanding of language?

8) Has there been any change in (Child's name) use of language?

9) What are (Child's name) areas of strength?

10) What are (Child's name) areas of difficulty?

11) Is there any other information about (Child's name) that you would like to share with me?

Thank you for taking the time to meet with me again and answer the questions about (Child's name).

Appendix 4B: **Follow up Interview - Teacher**

Thank you for meeting with me again. I have a few questions that will enable me to gain insight into the work done and progress made by (Child's name) since our last meeting.

1) What work is (Child's name) currently doing within the classroom?

2) Have you noticed any change in (Child's name) level of abilities.

3) Has there been any change in (Child's name) understanding of instructions through visual aids?

4) Has there been any progress or change in (Child's name) understanding of language?

5) Has there been any progress or change in (Child's name) use of language?

6) What are (Child's name) areas of strength?

7) What are (Child's name) areas of difficulty?

8) Is there any other information about (Child's name) that you would like to share with me?

Thank you for taking the time to meet with me again and answer the questions about (Child's name) current work in the classroom.

Appendix 5: Parental Biographical Questionnaire

1) Biographical Information

1.1 Child

Name and Surname:_____

Date Of Birth:_____

Home Language: _____

Sex:_____

Culture:_____

Address (Home):_____

Address (Postal):_____

1.2 Parents/Guardian

Father's Name:_____

Date Of Birth:_____

Tel (Home):_____

Tel (Cell):_____

Tel (Work):_____

Occupation:_____

Mother's Name:_____

Date Of Birth:_____

Tel (Home):_____

Tel (Cell):_____

Tel (Work):_____

Occupation:_____

1.3 Siblings

Name (s): _____ Date Of Birth (s): _____

_____ _____

_____ _____

2) Family History

Parents (Any inherited disorders eg. asthma, heart problems, learning difficulties etc):

Child concerned (Any inherited disorders eg. asthma, heart problems, learning difficulties etc):

Siblings (Any inherited disorders eg. asthma, heart problems, learning difficulties etc):

Extended family (Any inherited disorders eg. asthma, heart problems, learning difficulties etc):

3) **<u>Information relating to Pregnancy and Birth</u>**

Did you have difficulty falling pregnant?

_____

_____

Did you have miscarriages before falling pregnant?

_____

_____

How old were you when you fell

pregnant?_____

What was the age of the father at the beginning of

pregnancy?_____

Was your pregnancy

planned?_____

What was your/mother's general state of health during pregnancy eg viral infections,

illness, German Measles, stress, excessive morning sickness, haemorrhage?

_____

_____

_____

Were any prescription drugs taken during your pregnancy?

_____

_____

Where there any blood type complications during your pregnancy?

_____

_____

How many weeks did your pregnancy last?

_____

_____

What was the duration of your labour?

_____

_____

Did you have a normal or caesarean birth (if caesarean state reasons)?:

_____

_____

_____

4) Neonatal Period

What was the birth weight of your

baby?_____

Were there any complications during the birth of your baby?

_____

_____

_____

Did you breast feed or bottle feed your baby?

_____

_____

Did your baby have any feeding problems?

_____

_____

Were there any difficulties introducing solids?

_____

_____

5) Milestones (Please indicate approximate age of):

First smile:_____

Held head up first time:_____

Sat unaided:_____

Stood unaided:_____

Crawled:_____

Walked unaided:_____

Began babbling:_____

First words:_____

Sentences:_____

Understanding and response to commands:_____

6) Medical History

Has your child had any significant illnesses?

_____

_____

_____

Has your child ever been in hospital (if yes please give a brief description)?

_____

_____

_____

Has your child experienced any recurrent illnesses (eg. ear/nose/throat infections):

_____

_____

_____

Does your child have a history of seizures, convulsions or epilepsy?

_____

_____

_____

Is your child on any medication at present (if yes supply name and dosage)?

_____

_____

_____

Has your child had any long term treatment or therapy eg occupational, speech, psychological, remedial?

_____

_____

_____

What immunizations has your child had?

_____

_____

_____

Does your child have any allergies?

_____

_____

_____

Does your child have any coordination difficulties?

_____

_____

_____

Does your child have any visual problems?

_____

_____

_____

7) Family Relations

Describe the relationships your child has with your immediate family members:

_____

_____

_____

Describe any behavioural or emotional difficulties your child may have:

_____

_____

_____

If both parents are working what are your child's day care arrangements:

_____

8) Emotional and Social Development

How would you describe your child's personality?

_____

_____

_____

How would you describe your child's relationships with his/her friends and siblings:

_____

_____

_____

Please indicate (tick) if your child has difficulties with any of the following:

Sleeplessness:	_____	Sleepwalking:	_____
Nightmares:	_____	Talks in sleep:	_____
Restless sleep:	_____	Easily frightened:	_____
Tic:	_____	Nail biting:	_____
Tantrums:	_____	Fear of dark:	_____
Need for attention:	_____	Over dependency:	_____
Phobias:	_____	Thumb sucking:	_____

Unusual feeding habits:_____

9) School History

Has your child ever attended a playgroup or crèche, if yes please give a brief description:

_____

_____

_____

Has your child ever attended a nursery school, if yes please give a brief description:

_____

_____

Were there any particular problems experienced at any of the above mentioned playgroup, crèche or nursery schools:

_____

_____

_____

What schools has your child attended?

_____

_____

_____

Were there any problems experienced at any of the schools attended:

_____

_____

_____

What do you think are your child's main areas of difficulty:

_____

_____

_____

10) Has your child had any previous assessments (if yes please describe):

_____

_____

_____

_____

_____

11) Is there anything else you would like to share with me about your child:

_____

_____

_____

_____

_____

Thank you for taking the time to complete the above questionnaire. The information supplied will be held in the strictest confidence.

Appendix 6A: **Child A Parent Interview Transcriptions**

Question 1: Current work within the classroom.

Baseline: "I've got a vague idea, I must be honest, from the pictures that you send home, that I can see, and I also know about the subjects that you cover every Thursday, that they have got the excursions, um the weekly activities are based around that. Basically I think it is around the themes mainly. I think it is focused around that as well as obviously each child's individual needs as well. I just know that obviously he needs to acquire more social skills um more social interaction skills and that sort of thing. Although he has a basic form of communication um I think ja you know."

Pre Program Implementation: "Well I just follow through on the information on the programs that I get from the school. At the moment this week, I cant remember. They have done basic life skills like bathing, things like that. Brushing your teeth, hygiene, personal hygiene, the bedroom for instance etc."

Post Program Implementation: "Um ja, I think the focus has initially I am not sure if it is this term or last term on body parts. Currently he um bought home that book that they um compiled of all the um most commonly used objects

and things in it for them. So they have basically been focusing on that book."

Question 2: Identify and name letters

Baseline: "Basically the alphabet. I don't know how far we have gone so far, I have not tested him recently, because of the fact that you know we… I think he knows the alphabet and he can recognise certain words and things like that. And identify the words."

Pre Program Implementation: "Yes, specifically when it has been particularly related to a book. Um reading material there has been a slight decrease. I find that he can still recognise it but a lot slower. He needs a lot of provoking to get it out of him. But he can recognise stuff far easier than before, his responses are quicker. So I think the mental processing is helping a lot. Ja, Child A had a bad spell with the epilepsy, during the end of last year and beginning of this year but he has stabilised totally, he is on the right meds now. And also it improves his reasoning ability and what ever."

Post Program Implementation: "Yes um name letters recently and if it is huge writing he point and say the letters. Um much more focused on reading material, books

and things like that. Magazines."

Question 3: Recognize written words

Baseline: "Cat and dog and hat and things like that. Mmm, um well the reason is because what's happened is I have made cards for him and have put them above his bed, on his headboard so he sees them every night and things like that. Things like pat and those sorts of things. I need to progress a bit I have been a bit slack."

Pre Program Implementation: "Yes I think so, ja definitely. I cant tell you what words though but yes. I am sort of unprepared. Shorter words, things that he likes. Like dog, cat, snake he can recognise. I have also noticed that Child A is also very good with names specifically, gosh he can remember everything. Like way back, it will come forward again. So has got that ability with names."

Post Program Implementation: "Yes I think so basic words such as dog things like that, things that fancy his interest."

Question 4: Copy and colour pictures

Baseline: "No he sits and watches his sister do it. Um I think he is very much under sister control. At this stage. And he would rather follow than lead."

Pre Program Implementation: "I don't think so great. I think there is about a twenty percent improvement. If that. Still very much manipulative colouring. You can see he still holds it like that (palmar grasp). So his fine motor skills are still lacking.I think that coordination is there that never used to be. That fine motor ability. And picking up stuff and cleaning up. Like if he messes chips and it is fine little cuts he is able to pick it up and put it in the bowl. And rice and things like that."

Post Program Implementation: "Copying no not much. I think colouring definitely. Um he will chose a colour that will be um a little bit more appropriate, instead of a purple dog it might be brownish dog. I think it also comes from his sister that says "ugh don't use that use this, are you silly?'. He hears that every time."

Question 5: Copy and write letters or words at home

Baseline: "No."

Pre Program "Very limited. It is all on the visual perception basically."

Implementation:

Post Program "Copy letters yes he would try, letters yes definitely. Words no, I

Implementation: cant really say that."

Question 6: Spelling

Baseline: "Mmm that he can do quite well."

Pre Program "A little bit maybe, on the same level. The teacher may be the better

Implementation: person to give you insight into that. I just ask him to do this, do that, do this etc. I give instructions and delegate so I look at the responses more, I am more focused on that. How quick is it happening, or is it not happening or is there no understanding. For instance, tomorrow we are going away for the weekend and Child A is absolutely hooked on swimming. So I started yesterday or the day before, sort of conditioning the mind. The swimming is closed we now have to go for long walks, watch the ponies and things like that. I think that adult, more mature understanding is there now.

Where in the past there would be tremendous tantrums associated with that."

Post Program Implementation: "Yes if you point your finger to the letters."

Question 7: Understanding of spoken language

Baseline: "I would say below expected age level."

Pre Program Implementation: "Yes definitely and application there of."

Post Program Implementation: "Absolutely. I think there has been huge progress."

Question 8: Use of language

Baseline: "I think some of it is age appropriate because he's already um he has a very good sense of humour and the things that he says is very specific to the situation. He can sort of manage himself in adult company."

Pre Program Implementation: "Yes most definitely, drastic, he is talking in sentences now. 'I want milk', 'I am hungry', 'I am this….', 'I am that…', His

tenses are wrong, um but far more expressive. Clearer.
Very dominating, he tries to run the adults as well and manage the adults as well."

Post Program Implementation: "Yes definitely developing rapidly in my opinion. Advancing very well. Combining words together to try and make sentences. Not always appropriate but I think the understanding is there. And trying to relate it."

Question 9: Area's of Strength

Baseline: "I don't know? I think obviously if you take in terms of autistic people I think he is far advanced. The benefit he has got is that he can communicate, he is verbal and you know that sort of thing. Um other benefits are I don't know how to express it, ja, in terms of physical he has got benefits, in that he's got quite a lot of skills um through his horse riding and things like that. So certain of the things are balanced and the others are… they need more attention."

Pre Program Implementation: "I think his communication, his handling himself, his body, he is more comfortable with what he is, what he has got, who he is, the fact that he is a boy. His clothes, what fits in society. What

acceptable. Like he knows if he is going out to a smart place he puts his black leather shoes on. And takkies you wear there. He is able to make that differentiation. Like he knows you wear a tracksuit here and don't run outside with your undies on because it is cold, it is winter. Those things are there. In the past I have always had to decide for him and prove myself right, and prove him wrong. Now that is not necessary any more."

Post Program Implementation: "I think his ability to remember things. Like he is very good with names for instance."

Question 9: Area's of Difficulty

Baseline: "I think um communication, at this stage um, I think life skills maybe, certain life skills um and then also um I would say interaction skills in the sense of um what's acceptable socially. And those sort of skills ja, he would sometimes act inappropriately still."

Pre Program Implementation: "Still language ability, pertaining to his age level. To directly evaluate it like that. It's far behind. And then also still maybe on the body side, the balance, he is still battling with that. Fear of heights a little bit. Who he is basically in society. He is also experiencing peer

pressure from his sister who is almost a teenager. At one stage he tried to compete with her on the same level. Since then he has given up now and understands that he is the toddler and she is almost the adult girl. So I think he still has difficulties with that. And also understanding attention from people in the household, from mommy and daddy. You know he wants it immediate. There is still that baby like need. Every need has to be satisfied immediately. He still lacks that understanding that he must wait a little bit. The pot is boiling, you are going to put the oats in, then you are going to cook the oats and in ten minutes time the oats are going to be ready. Just to give you an example. A little bit hard still. Some times ok and other times not."

Post Program Implementation: "I think his ability to cope with life skills still. Basically eating the normal things. Making conversation, making friends adjusting to society in general. You know the bigger world out there."

Question 10: Additional Information

Baseline: "I just think he has progressed quite a lot in terms of his physical abilities in the last four months that he has been here. That's really progressed. And he is becoming quite a little boy now. Really that is

how I feel. And he has using his body language."

Pre Program Implementation: "Mmm I think Child A has matured a lot in the last year. Obviously also because of his domestic situation. His daddy does not stay with him and I am engaged again. So he has managed to adapt to that whole scenario. Which is wonderful and um he accepts everything else that goes with it. He has also accepted that daddy goes to work, mommy goes to work and we come back in the evening. And then we have got certain chores that we have to do. And certain times. There is still that very autistic behaviour of routine. The routine is still a huge problem in my life. Life is not perfect, but in his world it obviously is so, I think that to me I find a problem still and I would like to personally work on that. That you can bath first then eat, that you don't have to eat first then bath every day. I have also found that he has progressed, as I said he has matured. He is using knives and forks, he knows all the instruments in the kitchen, all the equipment in the household. I don't know if Teacher has told you he can work a microwave. Which is like a huge concern. And he plays his own CD player. At the concert last year he was quite determined. He was going to operate it not for the speech therapist. It is amazing, he cant read but he knows which button to push for repeat CD. He has learnt that technical little skill as well. And he will run and give me the remote, he just cant figure out all those

hundreds of buttons. He knows this remote puts on the DSTV. So I think he has really done well. I have noticed that he is not so keen and into his books anymore. Look he will page through the books and whatever and he is still very much into Barney and things like that. He will page through it if I ask him and with a bit of pushing do everything he has to do. But not like in the past, I think the attention is not on the ability to read at this point in time. More on the life skills like bathing, brushing your teeth, washing your face and stuff like that. This to me is quite a concern. I am starting to get a bit anxious about that. I thought it is like three steps back and two ahead. When you look at it and balance it off you think ok maybe not now maybe leave it a little bit, don't worry about that and then pick it up again at some stage because Child A used to be quite good at that at one stage. But there is just not an interest and He is more focused on visual material. That's television and stuff like that. And we would actually sit and watch a dvd and things like that. Like I have got One hundred and one Dalmatians, what was nice to know , what was nice to see was that he actually showed emotions, which he has never had before. He was scared, you now when Crualla de Ville, stole the doggies, and put them all in the bags and whatever, he would like run to my bedroom. And I would be ' Oh there is something wrong.' He did it two or three times and I did not click what was going on. I just thought that you know he was doing

	the normal hyperactive type of thing. Then eventually I went around the corner and realised you know what, it's the scary scenes, that he cant handle and he runs to me for consolation. But at least he is experiencing those emotions now, of being scared, of being happy, of being afraid, of being aggressive of being cross you know. He has developed a sense of humour as well. He does not say 'hello' he says hello (with and accent) and we say hello hymie (with an accent). ?And he laughs. He knows he is funny. And he has learnt to swear. Which is very very bad, but it is so cute. He uses ' Oh S.H.I.T' in the most appropriate contexts. It is too cute for words. Also sensory texture and stuff like that, on the tactile stuff, wonderful. He never used to touch my hair, now he comes, and says long hair and short hair and spiky. And then he actually makes it stand up spiky. Where he used to have 'grills' about hair. So it really has been wonderful. "
Post Program Implementation:	"Ja I think Child A has been progressing quite nicely here at the pre school. Especially in certain areas, obviously from all the input he has been getting."

Appendix 6B: **Child A Teacher Interview Transcriptions**

Question 1: Current work within the classroom.

Baseline: "Child A is currently in the classroom adhere to a more formal structure. The priorities at this point in terms of goals, are behaviour management, independence and since his medication has supposedly stabilized, toilet training."

Pre Program Implementation: "Child A has had a bit of holiday time in between, his family has been on holiday. He has missed out on a week and a bit of the program but he continues to approach sight words, but his focus is not as strong as his peers. The sight words are that of names in the classroom, coupled with surnames. That is something he has not looked at. He cant recognise his own surname and we are working intensely on number so his sight words will be number together with the theme clothes. We also have a new topic and its been put into a book with sight words, and that topic has been derived from a set of core words last term taken from our theme on clothes. The verb constantly used is that of 'look' and Child A has been given a book and in lessons he has physically made visual support for the words covered in the book."

Post Program "I must tell you at the onset that Child A has had a very disruptive

Implementation: term. And I see regression. And that is in terms of, not so much literacy, but in terms of babying and motivation. I am seeing a passive child. The reason for his disruptive tern is that his mother has had two operations and he has not been bought to school and they also chose this term to go on holiday in. So in short there has been more breaks than there has been school which has made the work load difficult to cover. He has not been given a book because he has not been here to receive a book and he has missed the ground work for that book. Right now unfortunately he has been coasting in a program where I am not sure a lot of work has had meaning for him because he has missed the foundation. So he has participated but I noticed more than anything that he tends to chew t shirts, put fingers in his mouth, which is concerning. So you can almost say there has been little or no change in the work he has done since our last meeting it has just continued."

Question 2: Pre reading and Reading Abilities

Baseline: "Child A at the moment is displaying strangely enough what I would describe as passively resistant behaviour. So to get him to actually talk to people like his speech therapist, who does quite a lot of that work with him, is difficult. This behaviour is undermining

his output at the moment."

Pre Program Implementation: "It is hard to judge his pre reading abilities for a number of reasons, the dynamics of the class is large so there isn't a formal programme and Child A's position within the dynamics of the groups is towards the lower part of the group. He also presents with a few behavioural problems that seems to undermine his progress. But what I have noticed um in terms of pre reading and pre literacy skills are a much improved vocab, an extended vocab and the ability to problem solve which would intimate that his receptive language has also increased. Also his response time seems to be that much shorter and far more active."

Post Program Implementation: "Again not really, because he has not been at school, nothing that I would like to report on."

Question 3: Awareness and Use of Phonics

Baseline: "He is currently he is just talking about sounds of colleagues in his class like 'a', 'a', 'a' for Child A, 'k' for child K and that's how we go through that and the 't','t','t' for tuckshop, 's','s','s' for swimming. We are just on the activities that recur each week. That's

as far as we are on that."

Pre Program Implementation: "I think he remains on a plateau, I have not formally tested him, I have only noted it intermittently, so I would not like to comment."

Post Program Implementation: "Again nothing I would like to report on."

Question 4: Pre Writing and Writing Skills

Baseline: "No, he can't write his name. He has not shown any interest in writing his name, but because of assessments, you can say we have not applied as much time to that as possibly we should have. He appears very weak in the fine motor area. So what we have done is, we have spent most our time in the gross motor perceptual ie. understanding things from the top, bottom, going over, using his body parts more in a gross motor situation than a fine motor situation. With respect to Child A that is more of a second term or third term program as opposed to a first term program. "

Pre Program Implementation: "Bearing in mind that Child A is still on an intense gross motor programme and fine motor programme, his skills are very weak but he is at least committing himself to paper, whish is something he

did not do. He is far from writing his name. He does that hand over hand."

Post Program Implementation: "He is a little more motivated, well he was before his last bout of not attending school and we have not really done a lot of other work other than concert practice, tie and dye and elastic work. There was a slight improvement in that area where he was more compliant but we are still working on it. I would say unless a home support program is put in place and they take it seriously we could be close to not square one because Child A has made reasonable progress through out the year but we are going to have to catch up quite a lot of work."

Question 5: Spelling Abilities

Baseline: "He might occasionally say 't','t','t' for tuckshop, but this is the most I have heard at this stage. Also bear in mind he is one of the younger boys in the class and also bear in mind he is one of the quieter ones and in large class he can get lost."

Pre Program Implementation: "No, if he does spell them he spells them in a partnership relationship with myself."

Post Program Implementation: "I have not noticed."

Question 6: Understanding of spoken language

Baseline: "Oh I think he understands very clearly. Lots happening, this is also apparent when I read to the class at the end of each day. Its more a motivation or willingness to cooperate that undermines it. So it is difficult to gauge, but I think he is very close to average or slightly below."

Pre Program Implementation: "Yes and that's imminent in the way he is able to problem solve and even ask questions. What I really liked is that we went swimming and he is probably the most passive child in the class, alerted me to the fact that another child was disappearing and he actually told me in the correct response time ' Child S is running away, she will get lost'. That was a great shock to my system."

Post Program Implementation: "Yes I think he is more responsive to instructions. That has held it's own nicely um over the breaks. I don't know what kind of input has been given to him but my whole big, I have not had a meeting with his parents yet, but unless Child A is challenged and a program is taken seriously I think the efforts we are putting in are not going to

be maximised and realised."

Question 7: Use of spoken language

Baseline: "Again, because of his reluctance to cooperate, the time that he takes I would say below average."

Pre Program Implementation: "Yes I have touched on that. He is definitely more verbal and he has an effective use of verbal language. It is accurate; he can express himself quite accurately."

Post Program Implementation: "It's Child A's strength so he continues to communicate well, um but I would not say that there has been any great shakes."

Question 8: Area's of strength

Baseline: "His language, his receptive understanding of language. And I am guessing, he has the potential to be quite expressive, we are just not there yet."

Pre Program "Language. Language and expressing his needs effectively."

Implementation:

Post Program Implementation: "Language, literacy, although the speech progress report shows it was not great progress at all. I think it will be interesting to note where he did not achieve in that speech report."

Question 9: Area's of Difficulty

Baseline: "Definitely in the motor areas. Weak fine motor, gross motor and that is why we have spent a lot of time on gross motor, to strengthen him. Child A is not a strong boy. He is a waify boy. And I think a great undermining factor that also exacerbates his weakness is the rate of fits he appears to have. That's huge. And obviously they have tried different types of medication and that can only be disruptive to anybody. Stressful."

Pre Program Implementation: "He has challenging behaviour, however he is making good progress, for example he his, after such a long time, urinating in the toilet. I mean there was a big question on that because of his condition, epilepsy and um it is far from early intervention so that is great in terms of that. That was a weakness but the fact that he is achieving is a strength."

Post Program Implementation: "At this point in time in terms of school is his attendance."

Question 10: Additional Information

Baseline: "Oh he is a gorgeous little boy and I think he has a lot of potential and once he understands structure, once we align, lets say a more effective home programme if that can ever be, with a school programme, I think he can actually go a long way bearing in mind well hopefully his medication and his epilepsy. You know don't worsen. Quite scary."

Pre Program Implementation: "Yes Child A could do with the same home program, not program, link that we created with the Child K's home. He would benefit from that and it is an option."

Post Program Implementation: "Yes, somehow we have to sell a home program and I am just not so sure how to do it."

Appendix 7A: **Child K Parent Interview Transcriptions**

Question 1: Current work within the classroom.

Baseline: "Um, I know their subject is the body. So at the moment they are learning about all the body parts, and he does seem to be quite aware of everything at the moment. He is definitely talking about it all a lot. I know they are working a lot on his perseverations. Obviously he, this is specifically for him. Also this change over from one teacher to another. So from a behavioural point of view, they are working quite hard on that."

Pre Program

Implementation:

Post Program "At the moment they are doing consolidation so they are doing all

Implementation: the themes they have done throughout the year."

Question 2: Identify and name letters

Baseline: "Not that I know of."

Pre Program

Implementation:

Post Program Implementation: "Yes definitely. Not specific letters but he does recognise it is a letter and he will tell you a letter or he will start saying ABC or singing the ABC song."

Question 3: Recognise written words

Baseline: "Yes he can, actually he is quite good at that. He'll recognise Macdonalds, landmarks, so if there is a sign that is familiar, Pick and Pay, trucks that go past, he can recognise if it is Pick and Pay or Spar. Its quite amazing. So yes he can do that."

Pre Program Implementation:

Post Program Implementation: "I think he is recognising his name. He has often pointed out his name on stuff that has come home from school."

Question 4: Copy and colour pictures

Baseline: "Not really at home, I have tried to sit with him but, in the holidays we do, but not during the school term because I find it is too much."

Pre Program

Implementation:

Post Program "Very much better."

Implementation:

Question 5: Copy and write letters or words at home

Baseline: "We try to work on his name."

Pre Program

Implementation:

Post Program "Not a whole lot. But he will copy hand over hand or do it with you

Implementation: and he tries to stay within the lines so ja actually there is an improvement. Whereas before there was not really a concept of staying within what he is doing."

Question 6: Spelling

Baseline: "No."

Pre Program

Implementation:

Post Program "No."

Implementation:

Question 7: Understanding of spoken language

Baseline: "I would probably say below expected, that is the understanding of spoken language."

Pre Program

Implementation:

Post Program "Yes a huge difference in his understanding of language."

Implementation:

Question 8: Use of language

Baseline: "Also below. His vocabulary, sorry, his vocabulary is quite big. I mean he seems to know the names for everything. Um you know it is that sentence making is always the problem."

Pre Program

Implementation:

Post Program "Yes definitely. His sentences are improving."

Implementation:

Question 9: Area's of Strength

Baseline: "His outgoing personality, it is a strength because at least he is curious. He has a curiosity to learn. Which I think is a good thing. He has an incredible memory, an incredible memory for things that he sees, routes that we take, we can go once and he will remember where we are going, so that I think is a very big strength."

Pre Program

Implementation:

Post Program "Tenacity. He is very courageous and he will just try and try and

Implementation: try."

Question 9: Area's of Difficulty

Baseline: "Probably the processing of information that he receives. That is his biggest problem. And um I guess his behaviour, but I guess that all ties into the processing is not quite as good as it should be."

Pre Program

Implementation:

Post Program Implementation: "Change. Um and time gratification. What do you call it delayed gratification."

Question 10: Additional Information

Baseline: "That pretty much covers it."

Pre Program Implementation:

Post Program Implementation: "No I cant think of anything."

Appendix 7B: **Child K Teacher Interview Transcriptions**

Question 1: Current work within the classroom.

Baseline: "Child K is participating actively in almost al areas in the classroom and that stretches from gross motor, language development, any pre-reading and writing skills, um sounds of words, the sounds of beginnings of words, the sounds of beginning of activities, the beginning of peoples names, um he is also engaged in fine motor activities, and the finding of mazes, which would be pre writing activities, other pre writing activities ie tracing, tracing letters, tracing paths around different pictures. He is involved in everything actively."

Pre Program Implementation: "Child K is flying, soaring like an eagle. Just before the end of the holidays we called in his care giver and broached for the first time, what we call our multi disciplinary team approach, where the care giver spends time in the school. She was informs in every area that Child K works in, and programs were observed and goals were set and she was given a manual to read. A simple manual. And Child K has improved in absolutely every area. His, holistically, he is just in a role and I have enclosed for you some reading matter where is mum uses saying like 'I was very proud of my boy' and 'We have

made a huge break through' This is in a very short period of time because Child K has had a very, had you approached me about a month ago, he has had a high record of absenteeism because he could not shake off the winter colds. So in a very short period of time it is enclosed in your reading and basically those types of comments refer to his progress. School and home are working hand in hand. Very very successfully."

Post Program Implementation: "Child K for me has made the most progress. Child K also has reading books but as you well know he has a question as to what he can see. So we a greed with his parents that we would continue because there are signs at times that he sees what one hopes he sees but there are times perhaps he does see what he is seeing. And we decided to observe it and to keep going and to include him in a formal program."

Question 2: Pre reading and Reading Abilities

Baseline: "I would say he has a lot of potential and he certainly likes and thrives on the stimulation. What lets him down is his level of concentration. Every now and then his level of concentration sort of dwindles and he'll lie down on the carpet. But if you can maintain

his level of concentration he has a lot to offer."

Pre Program Implementation: "Oh absolutely. He has a natural affinity for books. Every moment when there is a choice in class as to what to do, he goes to the books. He uses absolute care and respect and love for books. He will occasionally lift his head and share what he supposedly is reading. So he is becoming ok with K,K,K, for Child K and he is responding to that."

Post Program Implementation: "Oh ja. Child K has got a far increased vocabulary in terms of receptive, expressive. He has got a longer concentration span, he has got a greater interest, he can converse, he can make links what ever the conversation is and his just very interested in what is going on around him whereas before he was like on another planet."

Question 3: Awareness and Use of Phonics

Baseline: "He knows 'k','k','k' for Child K, or at least he is aware of it. Um 't','t','t' for tuckshop, 's','s','s' fro swimming. I would say he does not necessarily offer those but he is aware of them."

Pre Program "Yes a great increase and I have also included a list of vocab. He

Implementation: too has a reading book and his mum has been informed about the reading book. Not exactly the same as Child A's, but on the same topic. His mum has been informed. She is going to take it home to the caregiver, she is going to go through it and I am sure there will be an improvement from there as well. Because in the programme we first dealt with the behavioural aspect. We have to bring Child K to a certain point before we could even begin any of this work. He really struggled behaviourally. I have not as yet had time to do a certain, the necessary amount of perceptual exercise, but I would worry about his visual acuity, his visual discrimination and I have asked both yourself and his mother, whilst we are working with reading books to start observing possibly the tracking of his eyes, any squinting of his eyes, change in facial expression so we can at least have a lead in some way if there is anything where to start looking. What I have noticed is that he does not know his colours. That could be two fold, that could be because I don't push hard enough for him to know his colours because I am aware of the fact he has a problem and I have been warned that he may not see colours so I have not pushed the issue. But it will be apparent sooner or later."

Post Program Implementation: "Sometimes yes. Sometimes. Like K, K, K, his immediate name, um, I think he might go for t, t, t, tuckshop, if I am correct and um

he does not do it spontaneously like some of the other children. If you converse with him he knows what you are about whereas before I think it had little relevance. Now he is maybe looking for a sign but he is not doing anything spontaneous."

Question 4: Pre Writing and Writing Skills

Baseline: "He does not try write his name spontaneously and because it is so early in the term I have not really tried it with him either. Not words but is busy on circles. That's where he is at right now. Maybe shapes. Voluntary which is quite nice. It goes in with body parts, it goes in with shapes, we have done both of those, so I am hoping it is a consolidation."

Pre Program Implementation: "Absolutely, not in terms in being able to write his name but I have got the most beautiful specimen of work, it is a dot to dot exercise again joining number that I would like to show you so you can see his progress. He did it almost on his own, which is a huge difference. That is like a wow, so I will show you that when the interview is finished."

Post Program "Absolutely. He has got far more control. His skills are far more

Implementation: mature. His endurance is there. He could not sit at a table before, he can complete a very nice prewriting pattern you know in like joining the dots. Um his colouring, he knows exactly what is expected of him, he colours there has been a great improvement. Again I would go to the Vinelands and his OT report just to quantify his growth in that area."

Question 5: Spelling Abilities

Baseline: "He does not show that, also our programme has not given fait time to that. But he certainly will be when I eventually stabilise assessments and establish who is in my class and who is not he will certainly form part of the formal group. Where that kind of work will really sort of, hopefully go a long way."

Pre Program "No."

Implementation:

Post Program "No."

Implementation:

Question 6: Understanding of spoken language

Baseline: "Oh he understands it well, he is a trader, a negotiator, he will uh he understands everything. His expressive might not show that. With his expressive he links associative words. Very much an associative thinker. If you ask him what uh, if you point to a picture of a lock and ask him what it is he will tell you key. You know he makes associations. But ja, he understands ninety percent of what I say in a day. He is close to age appropriate."

Pre Program Implementation: "Oh yes, enormous extension."

Post Program Implementation: "Oh yes. He understands language, he understands tone, he understands volume and his response rate is that much quicker as well. Even in given an instruction, he is not floating around and you don't have to hand over hand. He knows exactly what's going."

Question 7: Use of spoken language

Baseline: "Child K never or rarely uses prepositions, and whatever words he uses he asks in the intonation of a question. Bubbles? Sweeties? Bus? Um if you tell him mommy wears a scarf around her neck, he will say 'and handbag?' That's what he did today. Everything is

associative and he is making the links cognitively but I don't think he is expressively. It is an emerging skill. So below expected age level."

Pre Program Implementation: "Yes, I have included lists, his mum has written down words, there are stacks of words,. He says my name, he's getting a very good understanding of language in that his attention span is a lot better. His receptive, he listens for hours to what I am talking about, then he will use an associative piece of language, which I would actually like towards changing but we are still there, this indicates that he has actually taken every thing I have said in. That's great, I have noticed that on several occasions."

Post Program Implementation: "Oh yes. Child K's, I suppose because he has a lot of stimulation at home, Child K comes up with very strange words, big words like chimes. You know you would think, unless he has a Cuckoo Clock at home, I don't know. But I mean you know you are trying to teach him d, d, d, dog and he comes up with chimes. So has got a very good increased vocabulary and sometimes he just shocks you. In fact Jenny mentioned one the other day and we can go to her and ask her, it was also phenomenal, it was one of those. I can't actually even remember it but yes he's taking it all in."

Question 8: Area's of strength

Baseline: "His thirst for stimulation, thirst for stimulation, uh home background, the input there. His understanding of receptive language, his interest in books. I think that is about it."

Pre Program Implementation: "His love for books. That is going to stand him in real good stead in terms of literacy and home background in that he gets a story every night."

Post Program Implementation: "He has tenacity and endurance that I have never seen in my entire life before. Ja. Those are skills. I mean he can be at the bottom of the class but those two skills are so strong they will take him through anything. And that was also a reason why having those skills to such strength to such extent is why we decided to include him in a formal program. Because if he approaches a formal reading program in the same way he has approached a gross motor program which is really a challenge for him, ok, more than any phonic or literacy program, then hey who knows."

Question 9: Area's of Difficulty

Baseline: "Behavioural. He cannot delay gratification, he, its also a strength but at present he probably perseverates is a weakness, his trading, Child K will trade every situation with everybody and anybody. It is a strength too, I don't want to dampen the spirit of that strength but it needs to conform it self and I think that is his greatest weakness. His perseveration, um also fits into his autistic characteristics, his perseverations are physical like spinning, he will spin, he will flap and if you don't stop his hands or stop him from spinning he will continue that. That is a characteristic possibly related to his syndrome. He also however perseverates on some thing he wants like bus? Bus? Bus? Because he has not a concept of time. Now we have worked exceptionally hard on that. We've worked on finish, later and now. And we deflect his perseveration. If he wants bus? Bus? Bus? Bus? We will also perseverate, we are trying that as a possible approach I say 'Listen Child K, suitcase, put you suitcase away' and I will tend to perseverate on that until he realise that there is no go with his bus but he better go with his suitcase. And ja I would say in a very short space of time there has been a change. Slight change. Colomboma. I am not familiar with that one hundred percent but that would be referring to his eyes. Because I brain stormed with his teacher prior, I don't work on things like colours as I do with other children. It is an incidental sort of thing with

Child K. He tends to, so I don't push a colour with him if he does not know it, I am mainly still assessing that. But what I have noticed is that Child K looks at things sideways and today I made the comment that I hope everything is ok. He tends to either looks at things on his head, lying on the carpet, or he can hold things a little bit like Ntutu used to, so I have not had enough time in an observation position to actually assess him."

Pre Program Implementation: "Challenging behaviour, but we have put in schedules and when you read extracts from his communication book, in those areas he requires structure but ja, there's major breakthroughs."

Post Program Implementation: "I don't know if it is a difficulty. It only becomes a difficulty for those around him if it is not managed, his areas of difficulty are that he manipulates an environment to such point that it actually presents in inappropriate behaviour. He markets himself badly but when he only does this when he senses a weakness and he has got such a strong intuitive gut that Oh boy, if he thinks you are not even strong enough he will walk over you. But that just does not happen with me but ja he does it with his mum, he does it with his dad and I gave them an intervention technique yesterday, where I just gave them the action cut\chop thing that that is enough, a very definite, not a pansy type thing and they tried it last night with him. It is

simple as 'It is finished' and they spoke assertively and they pantomimed it assertively and they said in two seconds he just stopped and looked at them and it was just so unlike what they were used to that they all just burst out laughing. It probably undid what they had just done but they said they got such a shock and it is just intervention techniques. That's what's needed."

Question 10: Additional Information

Baseline: "I think we need to get hold of Lydia, his domestic lady at home, because he is negotiating his way around her in circles I guess but I am almost sure. Uh and talking to the mum she seems to agree with that. And this is undermining his whole potential in class. Because home is not supporting class in that respect. That is about it."

Pre Program Implementation: "I think we should invest every ounce of energy, revelations, new ideas into Child K because he has got the most positive support system and they are super motivated as they have noticed a great difference in his behaviour bearing in mind he was asked to leave a school because he could not make the grade."

Post Program "Diet, you see Child K has learnt a lot through movement. And if it

Implementation: becomes difficult for him to move I fear it will limit his learning. So they are off to check out his diet and they said that because they monitor him they said he has put on eleven percent of his total weight in two months. So it is quite an acute observation on behalf of themselves. Again I could not quantify it because I did not have a scale to put him on but he weighs, I think he weighed thirty kilo's and he put on eleven and now weighs forty one and that was eleven percent of his weight. And so that was an acute observation."

Appendix 8A: **Child Z Parent Interview Transcriptions**

Question 1: Current work within the classroom.

Baseline: "Um basically I have seen the program for this term, in terms of the themes that they cover every week, and what I have seen, I have seen um they are doing road signs, and last week they were doing, I have forgotten but road signs haha. He does recognise them, all of a sudden when he sees a red robot, he says stop and when its green he says go and even when we are walking and crossing the street he says stop and walk."

Pre Program Implementation: "Um what I have realised what they are doing at the moment, they are doing art, they will be doing colouring, they will be doing labelling of shapes and cutting of shapes."

Post Program Implementation: "Well he has been doing a bit of phonics for reading, that sort of thing that I am really really aware of that has made a difference for him. More reading."

Question 2: Identify and name letters

Baseline: "Ja actually he can identify all the letters from a to z. It is something I have realised recently when he went home, he can recognise capital and small letters. He says 'a' and then 'b' for B and 'l' for L."

Pre Program Implementation: "Yes actually his ability has improved quite a lot. He is now able to take a magazine or newspaper and recognise certain words and read them out. As well as like he already knows words I think they are called phonics. Like t,t,t, says a word."

Post Program Implementation: "Ja, he does understand. He knows them all. It is for now more of a problem when he has to put them together, like in a word. Like he still cant make, he knows every time in a word the first letter in a word. He is one hundred percent with that."

Question 3: Recognise written words

Baseline: "Yes he can recognise a lot, like even now he can recognise even stores like Woolworths, as much that sometimes he does not even know how to say them, but he can write them down like he sees them and is able to write them down like Woolworths and Edgars

and Jet, ja I think those are the three main ones he can recognise and even cars. Like he spell all of them as much as he does not know how to say them, some he can say like BMW, he can say ' this is a BMW. And like he can spell Volkswagen, he can spell Renault, he can spell like most of them Toyota, even animals as well, like elephant, lion, tiger, he can say them."

Pre Program Implementation: "Yes in magazines, books, he likes reading quite a lot."

Post Program Implementation: "Ja. But what I have found with him, you see, he will come with a book. He has got books at home that we read to him. Little reading books that we read to him. Very basic ones. So we will sit and he will point and when he does not know a word he looks at you. And once you say it he will never forget it. But the thing is, it is not that he can read it is because you have said it to him. That this word written like this is that."

Question 4: Copy and colour pictures

Baseline: "Mmm no, he has not really…although he used to do like people, he used to draw people but he has got colouring books that he uses and colours in ja."

Pre Program Implementation: "He is progressing quite well. He is more keen than before. He has got books that he uses and colouring books, normally we buy them colouring books."

Post Program Implementation: "He is doing very well. He is doing very very well. He keeps within the lines and now he can shade properly, whereas before, like a picture would be maybe scriblled in the middle somewhere and somewhere towards the edges and now he will colour in the whole picture and finish it. And now he can do a page, not like with the colouring, we had to tear out the pages and he had to do that page and he wont like want to scribble on one page and then move to five pages down and do that and finish a book in a day basically and nothing really coloured in."

Question 5: Copy and write letters or words at home

Baseline: "He tries to make us write even when he went to visit my parents, he wants to do that, what we have done is discourage him, I he wants to write he must write, so we never encourage him to make us write, that is why following your advice last year we bought him those pencils that teach him how to hold them correctly."

Pre Program Implementation: "Yes there has been an improvement with his fine motor, even the way he handles the pen. The way he holds the pen, there has been quite a change. Also he has moved away from using capital letters to using small letters."

Post Program Implementation: "Ja, once he has seen a word he can know what it is. I mean the other day he was sitting there and he just looked at a word and it was Microsoft and he said Microsoft and I was, it is a difficult word and he looked at it and it was Microsoft. But he is like that with how money words. I was talking about that the other day when I read his report because I did not come in for the meeting and I said that I think the school is not actually aware of how many words he actually knows. He knows a lot of stuff. I don't know he is sort of like a sponge, once he takes something he knows it. You can show it to him twelve o clock at night and will know it. He knows a lot of stuff even stuff that I, the other day I came home with my groceries, he likes reading them everytime and I had cones, they were sugar cones. He took them out and read sugar cones and packed it away. I did not expect him to know that. That is not an every day kind of word, but he read it and I have never really taught him how to read things like that.

Question 6: Spelling

Baseline:

Pre Program "Yes he can spell basic words like Cat, Horse, Lion."

Implementation:

Post Program "He does he starts because he will start with like the first letter and

Implementation: try to put in the second letter and he sort of gets a bit lost around then. And you have to fill it up for him. And once you have done that he knows it."

Question 7: Understanding of spoken language

Baseline: "I think at the moment it is below expected age level, given that he is six years old, if you look at um his peers he is behind."

Pre Program "Yes he does. Now you can give him instructions to do things and

Implementation: he can relate to situations and he remembers things. He remembers days and knows exactly what is happening on which day without you having to tell him that this is happening on which day. He knows what you are saying. You can tell him to go fetch things, he

knows what to bring now so he can understand."

Post Program Implementation: "I think so. It has improved a lot."

Question 8: Use of language

Baseline: "Um it is still below."

Pre Program Implementation: "Yes there has been. What I have noticed is that he is now able to say three word sentences. Where as before he was saying one word. He is now starting to construct sentences."

Post Program Implementation: "He is more verbal. He is a lot more verbal and he initiates it on his own. He will come back from school, I pick him up in the afternoon and he will start telling me what happened in the day time. 'Child Z zoo today' and he will tell you, And 'what did you see?' and he will tell you 'I saw lions'. So ja he will try and tell you things so and so was fighting today, you know that sort of thing."

Question 9: Area's of Strength

Baseline: "Um I think his main strength is to… he is able to recognise things, and um you know like he has got a very strong recognition. He is able to recognise things and you think he is not aware of them. And until you see him writing them down. His writing skills are more advanced, you know than his reading skills, you know and um his communication skills."

Pre Program Implementation: "Areas of strength, I would say memory, he has got a very incredible memory, I think that I his biggest strength. And he tends to remember things you would not think he understands."

Post Program Implementation: "That is hard. I think in terms of me when I think of strengths. Um, I think, I will take it from a point of view of his mind, I don't know but he seems to be able to remember so much. Remember things and they just stay there, even when you think it is gone it is like there. He has a very strong memory. I don't know somehow he is able to see something and you tell him what it is and he puts it somewhere. He is not the type of child, you will teach him something today and tomorrow you will have to come back and start from scratch. Normally when you have taught him something it stays even if he does not use it."

Question 9: Area's of Difficulty

Baseline: "I would say at the moment language, ja like his speaking, I would say at the bottom is his language and then his understanding, his understanding has improved quite a lot but he can still improve better, ja he still gets confused sometimes when you give him instructions."

Pre Program Implementation: "I will say communication, language like conversing basically, he is still struggling."

Post Program Implementation: "I think for now he loses patience. Um once he has done something he wont focus as much as he would so he wont get as much out as he would. He still has to learn to be patient and understand disappointment and we have to read we can watch tv, we cant go to Macdonalds today we need to. He takes it a lot better, a huge improvement, whereas before he would have a huge tantrum but now he just turns around cry. Then you know he is crying but he knows he is not supposed to. He does not want you to see him crying."

Question 10: Additional Information

Baseline: "I think at school he is doing well, I've seen, the first of October was his one year anniversary since he has been here, and I must say I mean his growth has been exponential, He started going to crèche or school environment when he was about two years, he started mixing with other children. His development has been very slow, but since he came in here, I mean we even went to, we went for speech therapy consultations, there were no big improvements, but since, since he has been in this school environment, he has improved very well."

Pre Program Implementation: "I cant think of anything to say other than I think I would like to see him doing more complicated stuff like reading for instance, reading, writing. I think if he does that it will also teach him to speak."

Post Program Implementation: "Um, I guess you guys know more about him because he is here most of the time. I just, I feel like he as at that point in his life where he could learn more. But with me at home, I was telling his dad that some times I don't know how to teach him. How to put words together and things like that without telling him what the word is. Ja because of the way he grasps everything, if you tell him this is green he is not going to try understand how it fits together. What the sounds are in the word. You know once he knows it."

Appendix 8B: **Child Z Teacher Interview Transcriptions**

Question 1: Current work within the classroom.

Baseline: "Well before we go into any detail I need to um let you know, together with the fact its term four we have a lot of other things that we are doing. Child Z shows great interest in any orthography. He would rather on any of this work uh write associative words, phonetic sounds on his work than either colour it or cut it out or any other instruction given. He is aware of the phonetic sound that his name begins with, he is able to read his name, he is able to write his name unaided, he is able to recognise most the phonetic sounds of the peers in his class. He recognises without visual support the names of the peers in his class together with the staff in the class, together with external staff being speech, OT, psychology and music. He also spontaneously writes down his versions or interpretations or perceived visual shapes of phonics. Not always correctly, sometimes reversed, sometimes uncompleted, sometimes with extensions but he speaks of them and they can be recognised when he interprets what he is writing."

Pre Program "Child Z, I am desperately trying to put him on some formal type of

Implementation: program but I need to stress at this stage that the dynamics of my class are very varied and this makes it very difficult to put him on an exact program that he requires because he could almost be on a formal program, he has the capacity to actually take that now but in any which event we are following numbers, we have made a reading book as we have for the others. He has more sight words to read. Please feel free to view his book. I am sending number sight words home and um he is on everybody's surname at the moment um and lots of perceptual work and differences. I can give Child Z more than anyone in my class if time permits I give him more of a formal program. What he is doing is working independently. I can now say Child Z this is how I want it done and he does it. I don't have to apply any extra individual attention to him, he can carry on. But I must tell you how ready he is for a program, today we were counting, I put out the numbers one , two, three, four, five because that met the average norm of the class. Child Z is past one, two, three, four, five but we pointed to the one and showed one finger, we pointed to the two and we showed two fingers and so it went till we got to the five and showed five fingers and Child Z was the first one to go after the adults. I said 'Child Z can you read the numbers?' He pointed to the one and showed one finger, he pointed to one he showed one finger, he pointed to the two and showed two fingers. He takes in absolutely everything. Which intimates his

perception is more than ready. I also need to emphasize that his parents are also very keen for him to start a formal program and I believe it is the responsibility of the school to create the environment in which he can embrace it, otherwise we are doing him a disservice and we are undermining his potential and time is of the essence at this point. That is my biggest nightmare."

Post Program Implementation: "Child Z has been given reading books with core vocabulary. That would be core vocabulary to him, he has reversed this vocabulary during terms works. He has three, been given three reading books that are pertinent to core vocabulary. One on my house, one on my clothes and one on myself. Which he reads absolutely perfectly. And he reads the list of extra words at the back as well. However when there are words that are very similar, and would be words that extend him ie clock and clog, it becomes apparent that Child Z is memorising as he has a very strong visual capacity and memory but he does not always have the concept and the great breakthrough is that communication partners outside the school and people that have been trying to support him in terms of a literacy program have now seen the light and you can say that the multidisciplinary team are going to come together to formulate a formal reading scheme that can help him from filling the gap situation where he understands concepts and he is reading about concepts he

understands together with a slight extension not just relying on visual acuity and visual memory."

Question 2: Pre reading and Reading Abilities

Baseline:

Pre Program "Absolutely, Child Z is a sponge and whatever you show to him.

Implementation: Ok phonetically we started with z,z,z for Child Z now it is z,z,z, for zoo, z,z,z, for xylophone. Sometimes I have to go to the dictionary to find out if there is such a word. He is giving me z,z,z, for zip. He works through each obvious phonic of the alphabet in that same manner. So his ear is tuned, his auditory discrim seems to be fine. He is just hungry. He adapted very well from Z to z. A to a so he has done that perfectly."

Post Program "Oh Child Z is just soaring. Um he is just initiating, he has gone

Implementation: from, if a think of him not recently but in the early days, he has gone from a passive non verbal child to a chatterbox that I sometimes even have to contain in the classroom. I only stop myself from doing it but we have actually achieved a goal."

Question 3: Awareness and Use of Phonics

Baseline: "I think Child Z is very aware of phonics. But what is more evident in Child Z is his desire to explore phonics."

Pre Program Implementation:

Post Program Implementation: "Yes Child Z always, well maybe not always but very very often refers to objects usually nouns but verbs as well with sound, the initial phonic sound. For example the verb jump ge would say j, j, j for jump. It can be t, t, t for table. It is very much a part of his vocabulary now."

Question 4: Pre Writing and Writing Skills

Baseline: "He tries to write apple. He tries to write elephant. He has tried to write (Teacher Name). He was written 'W' for Woolworths, but that is not a word. That is far as I recall up to now."

Pre Program Implementation: "Absolutely. He takes and instruction in once and then he moves. Look fine motor is still his weakness. But he knows the direction in

which he is going and he has made very pleasing progress in that area. And I believe with out intensified group OT situation that that problem will be overcome."

Post Program Implementation: " Yes, and this has showed, and I suggest that you follow up in OT assessments and Vinelands. Child Z has actually caught up a year, bearing in mind that he is actually a special needs child, he has caught up a year overall in his assessments. Which incorporates things such as fine motor, he is almost independent, he is not perfect, he still needs refining. He has made great strides and that is in writing his name, colouring, holding the pencil, cutting with a pair of scissors."

Question 5: Spelling Abilities

Baseline: "I have not really had the opportunity to explore that. And if he has it may have been spontaneous and I may have overlooked it in the classroom situation."

Pre Program Implementation: "Yes I think he is. It is just that we have not explored that avenue, but in the little incidental ways we have I think he could spell cat, mat, the very simple phonics. It's just that we cannot get around to

that in the day."

Post Program Implementation: "I don't do a lot of spelling with Child Z, so I have really noticed that."

Question 6: Understanding of spoken language

Baseline: "Child Z is how old? Six, understanding, given the settling down time, I think his understanding probably is on a par if not slightly below."

Pre Program Implementation: "Oh yes. Child Z can sit for hours listening to what I have to say. And he come back. His word order is not fantastic, he mixes things up or he leaves things out or he talks in typical autistic style. So I will say something to him and he will come back and he will have interpreted it in his own language and he will also add his own additives such as Child S made a poo, he said 'Child S is dirty, she is a baby. She needs a nappy and she is going to jail for making a poo.' So he clearly gets a concept and he is relating language and I now have to tell him, from a non verbal Child Z that I remember him as, I now have to tell him to wait his turn or give someone else a turn. Which really is a three sixty turn around."

Post Program Implementation: "Oh ja. And for that you would need to refer to the speech therapist. He has made great strides, absolutely great strides. It is difficult for a teacher to quantify because we do not have a formal testing system. And we don't have exams or a test or anything like that but it has been quantified in the speech and Vinelands."

Question 7: Use of spoken language

Baseline: "He is not yet as confident as I would like him to be. Although we had an incident this afternoon where he came to rely uh something that happened to him on the playground and he relayed with the most confidence I have ever seen him talk. It did not matter, I think he used three different languages then English, Zulu and vocalisations. So ja given time he will go far I think."

Pre Program Implementation: "Child Z is speaking in sentences. His latest one, we went swimming on Tuesday and Monday was the preparation for the event. Child Z told us his dad is buying him a blue swimming costume. Dad is buying him a blue swimming costume with a spiderman on it. Ja he has got his perception of time, tomorrow is, ja in every way. In every possible way. I mean it is difficult to

measure but if one was listing all the words we would fast be doing nothing else."

Post Program Implementation: "Oh yes, there has been a great improvement. There are sentences. The only thing I would like to work on are complete sentences and question technique. He's still using intonation of voice to pose a question, rather than a proper question. And his responses to questions are accurate now, whereas they weren't before."

Question 8: Area's of strength

Baseline: "Very definitely his desire for orthography."

Pre Program Implementation: "Language, memory! His capacity to remember is unbelievable as is his thirst for knowledge together with his very supportive home background. He has got discerning parents and that is why they are requesting formality in his educational program, rightly so."

Post Program Implementation: "His visual capacity, his love for literacy, his new found and growing confidence that has turned him into a sponge with knowledge, facts. Numbers he is very good at."

Question 9: Area's of Difficulty

Baseline: "His emotional immaturity."

Pre Program Implementation: "Emotionally he still has his little outbursts. It is difficult to accept not having a turn, it is difficult to accept wait your turn, it is difficult to accept that Sprite has run out in tuck shop and Tab is your only choice. It is those emotional moments together with fine motor."

Post Program Implementation: "It still remains, although there has been an improvement in both these areas emotional, again it is limited but it is still there. But what is nice is that he has begun to reason through it so he won't just blow snot through his nose, you can negotiate with him that it is not the way to go. And he has controlled it to only a few groups where the light is on him for a lengthy period of time. And the other area is fine motor. Again a lot of improvement. Those are still areas that lag behind his others."

Question 10: Additional Information

Baseline: "No, other than I think that if you have ability means or the resources a reading programme suitable to him would be very much appreciated that could be shared with me as his class teacher or perhaps working as a team or ja."

Pre Program Implementation: "Yes, Child Z is a potential, if inclusion is a good thing, then Child Z is a potential candidate for inclusion and like again I can't stress the formal program."

Post Program Implementation: "His dad and his step mom who are very supportive were thrilled with his progress and we have discussed things like diet which is new area, which could effect gross motor, which in turn will effect his whole learning program. So they will be looking at his diet as well. And he made a very interesting, dad made a very interesting um observation and it was very heartening that Child Z can actually say to people he sees that he will see them tomorrow or he will see them next week or he will see them on Tuesday or he will see them after the holidays or at Christmas time. So Child Z has actually grasped a very important concept in terms of time and this has been taught to him through constant routing. But he has grasped it and he is very accurate. And he has worked through it to a complex stage. Because to see you ate Christmas time. I mean that is quite something. Even to see you next week or next Tuesday, I was

thrilled with that. To me that was the biggest jump he has made."