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Imagery,cognition and memory: The influence of mental imagery on improving reading, writing, and spelling abilities of grade 4 children with learning disabilities

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Chapter 1: Introduction

1.1 Introduction

In South Africa, access to a good education is considered a right. However, there are many children who are not 'privileged' enough to afford this right, and who face a constant struggle to complete their schooling and gain the tools necessary for existence in our ever increasingly literacy driven society. Then again, amongst those who are fortunate enough, there is an increasing minority that also struggle to master these tools despite adequate instruction. In a study by Gaddes (1990), cited in Kolb and Whishaw (1996), it was found that 10% to 15% of all school-aged children had learning disabilities. Furthermore, Gaddes discovered that of these children only 2% are privileged enough to be receiving specialised education (Kolb & Whishaw, 1996).

In South Africa, with the uneven distribution of wealth and resources, and the limited access to education – let alone specialised education – one cannot help but question whether or not as many as 2% even have this privilege to this necessary form of education. In reality, access to the private (and often costly) remedial schools that exist being fraught with frustratingly long waiting lists and desperate parents trying to enrol their children. With these limitations to education in South Africa being as they are and with it known that the struggle to become properly educated may assume different forms, it has become necessary to devise methods that may reach the people.

The Targeted Revisualisation Programme – which is one such method - is any easy to use and cost-effective method that "can be introduced using available resources and

materials, or simple teacher-made aids and equipment" (Potter, 2001, p.5). Thus in its aim to "mediate the orthography of the English language, and to develop the capacity to analyse, memorise and use words in context" (Potter, 2002, p.1) this programme may be accessible to all children hence improving the standard of education available. As a result, this research lends itself to further exploring the effectiveness of the Targeted Revisualisation Programme on improving reading, writing, and spelling abilities of children with learning disabilities.

1.1.1 The Targeted Revisualisation Programme

The Targeted Revisualisation Programme, developed by Prof. C. Potter of the University of the Witwatersrand, employs the use of mental imagery to help develop abilities in children with learning disabilities (Potter, 2003). The high spatial competence of many children with learning difficulties has been commented on by a number of writers (e.g. Bannatyne, 1971; 1973; Eccles, 1966; Hecaen & Ajuiaguerra, 1964; Penfield & Roberts, 1959; Sperry, 1964). The programme builds on these spatial competencies through the use of multi-sensory teaching, and activities involving mental imagery (as set up by Fernald, 1943; Jaensch, 1930). It is based on the theories of mental imagery proposed by Piaget (Piaget & Inhelder, 1971) and the integrative view of reading and writing proposed by Luria (1973).

As such, the Targeted Revisualisation Programme introduces a variety of contextualised activities involving the integration of reading, writing and spelling, and focuses on developing both simultaneous and successive processing abilities through the use of high-imagery teaching techniques (Potter, 2003). The programme has been

specifically designed to aid the remediation of children with learning difficulties in the areas of reading, writing and spelling, and aims to help those children who have thus far been unresponsive to alternative treatments and remediation. The aims of the programme are “to mediate the orthography of the English language, and to develop the capacity to analyse, memorise and use words in context” (Potter, 2002, p.1).

The programme has five levels that all use multi-sensory methods to develop skills needed to improve abilities in reading, writing and spelling. Each child is initially placed on a level that is suitable for his or her needs and individual performance, based on a process of error analysis. Reading, writing and spelling are then dealt with simultaneously whilst errors made by the child are targeted. Both simultaneous and successive processing skills are developed as the child is exposed to the different levels of the programme, which are introduced flexibly, according to the child's individual needs and patterns of error (Potter, 2001; 2003).

The specific levels of the programme being described by Potter (2001) as follows:

Level One ~

This level assumes that the child has a degree of phonological awareness and that he or she has reached a level of readiness for reading. Once this is attained or confirmed, sounds and letters are introduced using phono-visual principles. The aim of level one is thus to develop a basic understanding of the alphabetic principle through a multi-sensory process, which involves perception, imagery, language and cognition. Level one activities include targeting one-syllable words and focuses on short vowel sounds, individual consonants as well as consonant blends and clusters at the beginning and

end of words. This being done in order to facilitate the development of a system for analysing and synthesising consonant and short vowel sounds in words and hence developing a rule system for developing words, all which makes the orthography of the English language transparent and understandable. The primary means of achieving this goal in this level is done using word families of rhyming words, and supporting these with short basic sentences based on the target words. Lastly, this entire process is supported by a graded scheme of reading books also introduced at this level.

Level Two ~

At this level the focus remains on developing a more advanced understanding of the alphabetic principle and its application in the English language. Level two is thus particularly concerned with developing an understanding of how vowels – when used in combination – form long vowel sounds and how syllables are combined to create polysyllabic words. In order to achieve this, the activities in level two focus on word families, writing sentences using targeted words, and reading from a wider variety of books.

During this level the transparency of the orthography of the English language is increased through the introduction of a seven vowel system, which includes the traditional set of vowels as well as the use of /y/ and /w/ as vowels at the end of a word. These vowels are all colour coded in computer based work, with the intention of training the ability to focus on the vowel structure of words and developing the perceptual and discriminative abilities required in matching vowel and consonant structures in the written word to its spoken equivalent.

Level two extends on what was learnt in level one and also uses the process of multi-sensory teaching, where imagery is used for the basis for developing memory for words as they occur both singularly and in sequences as sentences. "The aim of level two activities is thus to mediate the structure and rule systems used in written language both in the spelling and writing programme which is highly structured, and through analysis of words drawn from the accompanying reading programme, in which the child is exposed to texts of increasing complexity and length" (p.11).

Level Three ~

At level three paragraph revisualisation is introduced. The child is asked to identify and list all words using more than one vowel from sentences and paragraphs. These words are then structurally analysed and then individually targeted, imaged and revisualised. Thus at this stage perception and imagery are invoked with the aim of learning and identifying how combinations of vowels (as seen in words of one syllable containing vowel digraphs, as well as polysyllabic words) work to create sounds in the written form.

Structural analysis of these words includes the usual colour coding, but once this is done for polysyllabic words, such words are then divided into their separate syllables. Following this, the targeted words are imaged and hence stored in memory. Once these words have successfully been learnt and revisualised as separate units, they are then revisualised in sequence and in the context of their original paragraphs. The aim of level three is thus to facilitate the development of sequential and integrative skills and to hence establish memory for words as they are written in sequence.

Level Four ~

Level four targets fluency and accuracy in reading and writing. Regarding reading, the child is encouraged to read not only for enjoyment but for information as well, and as a result is encouraged to read more widely. Whilst on the writing level, the child is formally exposed to a number of registers relating to different themes and topics and is introduced to the conventions involved in descriptive and narrative writing. These writing activities are then linked to the spelling part of the programme, as the child focuses on learnt target words that relate to the theme on which he or she is required to write.

In order to achieve this levels aim of exposing the child to a wider variety of language activities and enhancing both their fluency and accuracy in reading and using written language, the core activities at this level thus involve:

> the introduction of a variety of descriptive and narrative writing activities based on the use of single images in the mind or represented in drawings, while story-writing is trained based on invoking sequences of images or pictures. Mind mapping is used to introduce and plan stories using themes and sub-themes, with single words being used to represent and sequence ideas and images. In addition, short stories and books are read to identify themes and sub-themes used by other authors in creating text. At this stage, mental imagery is utilised both as an assist to memory for words and their structure, as well as a way of structuring and paragraphing language.
>
> (p.17).

Level Five ~

This final level is based on the assumption that both the structural as well as the communicative side of the English language needs to be taught and thus introduces activities which focus on the developing of an understanding of the structure of English and activities that develop communicative competency. Such communicative competency including the ability to use language for different purposes, to adjust to different media and conventions, and lastly, to understand the language as it is used by others in different media and conventions.

In order to achieve this level five works closely with the curriculum and sequence of instruction that the child will be exposed to in the mainstream classroom and thus involves the child working on a number of classroom activities in as independent a manner as possible. In reaching this point, the programme at this final level has three main aims that are as follows –

1. to develop the basic skills relevant for coping with the activities that he or she will be facing in the mainstream classroom,
2. to develop the organisational and study skills needed to work independently on all tasks, and lastly,
3. to develop the ability to identify learning resources (in the form of support materials as well as support persons).

1.2 Research Aims

With the structure and aims of the programme in mind, the aim of this research was to explore the influence of mental imagery on improving the reading, writing and spelling abilities of grade four children with learning disabilities. As such, this research aimed to further explore the effectiveness of the Targeted Revisualisation Programme - compared to the results of traditional remedial teaching - on improving these abilities. In doing so, this research attempted to validate the findings of previous studies within this area, conducted in 2001, 2002, and 2003, which illustrated that the programme appeared to be indeed effective (Abelheim, 2002; Booth, 2003; Els, 2003; George, 2002; MacReadie, 2001; Picton, 2002; Ravenscroft, 2002; Sampson, 2002; Sfetsios, 2002; Wilson, 2001). Furthermore this research investigated the use of mental imagery as a learning aid, as it explored the link between mental imagery and memory.

1.3 Research Rationale

This research was relevant because it provided further information about the influence of high imagery techniques on improving reading, writing, and spelling abilities. This information may now be collaborated with the findings from previous studies done of this nature, and in doing so, it is hoped that reliable and valid assumptions may be drawn as to the effectiveness of the programme. As a result – if the Targeted Revisualisation Programme is found to be significantly influential – the programme may be added to the remedial curriculum of all schools catering for children with learning disabilities, thus aiding an already trying scholastic experience

for the child and increasing the standard of education available. Furthermore this research may serve as the base upon which further research into the areas of learning disabilities, mental imagery, memory and cognition, as well as multi-sensory teaching may be developed.

1.4 Research Questions

This research attempted to answer the following questions ~

- Is there a link between mental imagery and memory?
- Do children with learning disabilities use mental imagery as a learning aid for learning words?
- Is the Targeted Revisualisation Programme effective in improving the reading abilities of children with learning disabilities?
- Is the Targeted Revisualisation Programme effective in improving the writing abilities of children with learning disabilities?
- Is the Targeted Revisualisation Programme effective in improving the spelling abilities of children with learning disabilities?

1.5 Summary

This chapter has outlined the foci of this study as they relate to exploring the link between mental imagery and memory, and exploring the effectiveness of the Targeted Revisualisation Programme on reading, writing and spelling abilities of grade four children with learning disabilities. It was seen that learning disabilities have a high

prevalence rate and with the current situation in South Africa being as it is, it was illustrated how such research may benefit the standard of education available and what further implications such research may have. The Targeted Revisualisation Programme was introduced and the different levels discussed. Furthermore, the central research questions that this study aimed to address were stated.

1.6 Glossary of Terms

Terms used in this research are defined as follows:

- *Alphabetic Principle:* "The relationship between letters ordered left to right in a written word and the phonemes ordered in a specific temporal sequence in the spoken word" (Birsch, 1999, p. 491).

- *Attention-deficit/hyperactivity disorder (ADHD):* Disorder characterised by with attending to and completing tasks, impulsively and / or hyperactivity that frequently co-occurs with, but is not a learning disability. Also called *attention deficit disorder* (ADD) (Birsch, 1999).

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

- *Consonant Blend:* Two or more adjacent consonants whose sound flow smoothly together (Birsch, 1999).

- *Decode:* Word recognition in which the phonic code is broken, to determine the pronunciation of a word by noting the position of the vowels and consonants (Birsch, 1999).

- *Digraph:* The presence of two adjacent consonants or vowels in the same syllable that create a single speech sound (Birsh, 2000).

- *Dyslexia*: "One of several distinct learning disabilities It is a specific language-based disorder of constitutional origin characterised by difficulties in single word decoding. Usually reflecting insufficient phonological processing, these difficulties in single word decoding are often unexpected in relation to age and other cognitive and academic abilities; they are not the result of generalised developmental disability or sensory impairment. Dyslexia is manifested by variable difficulty with different forms of language, often including, in addition to problems with reading, a conspicuous problem with acquiring proficiency in writing and spelling" (The Orton Dyslexia Society Research Committee, 1994 in Birsch, 1999, p. 494).

- *Eidetic Memory:* The ability to retain an accurate and fairly detailed visual image of a complex scene or pattern. The ability to mentally view an image of the original sensory experience (Gray & Gummerman, 1996; Jaensch, 1930).

- *Grapheme:* "Refers to the pictorial qualities of a written word that permits it to be understood without being sounded out; a group of letters that conveys a meaning

(Kolb & Whishaw, 1996, p. 645).

- *Graphemic Reading*: (also called lexical reading) "Reading in which the meaning of a word is derived from the picture that it makes as a whole rather than by sounding out the syllables'. (Kolb & Whishaw, 1996, p 645).

- *Grapheme skills:* The visual gestalt of a word is used to access a previously learned sound (Kolb & Whishaw, 1996).

- *Iconic store:* A sensory store in which visual information is held for a very brief period of time (Eysenck & Keane, 2000).

- *Irregular word:* word that has an unexpected spelling either because its orthographic representation does not match its pronunciation or because it contains an infrequent orthographic representation of a sound (Birsch, 1999).

- *Learning Disabilities:* "A generic term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, and mathematics abilities, or of social skills. These disorders are intrinsic to the individual and presumed to be due to central nervous system dysfunction. Even though a learning disability may occur with other handicapping conditions, with socio-environmental influences, and especially with attention deficit disorder, all of which may cause learning problems, a learning disability is not the direct result of those conditions or influences" (The Interagency Committee, I 985 in Birsch, I 999, p 497).

- *Lexicon:* A dictionary-like store of words in the brain, containing their meanings, knowledge of the way in which they can be combined, and information about the ideas with which they can be associated (Kolb & Whishaw, 1996).

- *Linguistic Awareness*: Knowledge of linguistic structure that is at least partly accessible to awareness (Rayner & Pollatsek, 1989).

- *Long Vowel:* A vowel sound that is produced by a slightly higher tongue position than the short vowels (Birsch, 1999).

- *Morpheme:* Smallest meaningful unit of speech (Kolb & Whishaw. 1996).

- *Morphological:* "In linguistic terms, pertaining to the meaningful units of speech; a suffix, for example, is a morphological ending" (Birsch, 1999, p. 498). Morphological thus relates to the formulation of admissible words in a language (Kolb & Whishaw, 1995).

- *Multisensory:* Involving three or more senses, usually visual, auditory, kinaesthetic, or tactile (Birsch, 1999).

- *Multisensory Teaching:* "Any learning activity that includes the use of two or more sensory modalities simultaneously to take in or express information" (Moats & Farrell, cited in Birsch, 1999, p.1).

- *Orthography:* The writing system of a language, utilising correct or standardised spelling according to established usage (Birsch, 1999).

- *Phoneme:* "Unit of sound that forms a word or part of a word" (Kolb & Whishaw, 1996, p 650).

- *Phonics:* Paired association between letters and letter sounds (Birsch, 1999).

- *Phonological Awareness:* Both the knowledge of and sensitivity to the phonological structure of words in a language. It involves the ability to notice, think about, or manipulate sound segments in words (Birsch, 1999).

- *Phonological dysgraphia:* A condition where by familiar words can be spelt reasonably well, although non-words cannot be spelt without significant difficulty (Eysenck & Keane, 2000).

- *Phonological dyslexia:* A condition where by familiar words can be read reasonably well, although unfamiliar and non-words cannot be read without significant difficulty as impairment exists (Eysenck & Keane, 2000).

- *Phonological Reading:* "Reading that relies on sounding out the parts of words" (Kolb & Whishaw, 1996, p. 650).

- *Phonological Skills:* Converting letters into sounds using certain rules (Kolb & Whishaw, 1996).

- *Phonology:* Representations of speech sounds (Hulme & Snowling, 1994).

- *Regular Words:* Words that are spelled the way they sound (Birsch, 1999).

- *Revisualisation:* "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 output of the image into written or graphic form" (Potter, 2002, in McReadie, 2002, p 10).

- *Semantic:* Concerning the meaning of words and the relationships among words as they are used to represent knowledge of the world (Birsch, 1999).

- *Short Vowel:* A vowel that is pronounced with a short sound, an arbitrary sound that is unrelated to any aspect of the letter, like the name of the letter (Birsch, 1999).

- *Surface dysgraphia:* A condition where by irregular and non-words are spelt with difficulty, whilst regular words are spelt reasonably well (Eysenck & Keane, 2000).

- *Surface dyslexia:* A condition where by irregular and non-words are read with difficulty as impairment exists, whilst regular words are read reasonably well (Eysenck & Keane, 2000).

- *Syllable:* A written or spoken unit that must have a vowel sound and that may include consonants that precede or follow that vowel; units of sound made by one impulse of the voice (Birsch, 1999).

- *Syntax:* The structure of a sentence, also known as *Grammar* (Birsh, 1999).

- *Targeted Revisualisation Programme:* A five stage programme for remedial intervention which utilises mental imagery as the basis for visualisation and revisualisation, as the basis for storage of the structure of words into short-term and long-term memory (Potter, 2000; 2002).

- *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 (Sternberg, 1999).

- *Transparent Orthography:* An orthography of the English language based on a seven-vowel system, in which a, e, i, o and u are mediated as vowels in all positions in words, and y and w are mediated as consonants in positions at the beginning of words and as vowels in positions near or at the end of words (Potter, 2000; 2002).

- *Visual imagery:* "The mental representation of visual knowledge not presently visible to the eyes" (Sternberg, 1994, p, 217).

- *Visualisation*: "Ability to form a mental image of an object" (Kolb & Whishaw, 1998, p. 656).

- *Vowel Digraph:* Two adjacent vowels in the same syllable representing a single speech sound (Birsch, 1999).

- *Word superiority effect:* The effect that is said to occur when a target letter is more readily detected in a letter string, when the string forms a word than when it does not (Eysenck & Keane, 2000).

Chapter 2: Literature Review

2.1 Introduction

A learning disability, by inhibiting learning, renders the scholastic years of a young child fraught with trying and frustrating experiences. These "educational experiences often leave emotional and attitudinal scars that are carried throughout life" (Kolb & Whishaw, 1996, p.515). With such potentially devastating consequences it is necessary to devise methods that might ease these difficulties for the child with a learning disability. Thus, for the purpose of this literature review, it will be shown how the Targeted Revisualisation programme ties in with the related theoretical assumptions that allow it to be applied to children with learning disabilities.

2.2 Learning Disability

The term 'learning disability' had its origins in 1963, when Kirk gave an address arguing for the better description of children's school-related problems that were not as a result of sensory handicaps and mental retardation (Kolb & Whishaw, 1996). Kirk's address was successful in that it sparked the development of the Association for Children with Learning Disabilities. Today the term continues with the field of learning disabilities having been greatly researched and now including a wide variety of academic and non-academic learning problems.

Learning disability is an umbrella term that refers to a variety of problems that are school-related, with formal definitions including the assumptions that "the individual

has adequate intelligence, opportunity to learn, instruction, and home environment, yet still does not succeed" (Kolb & Whishaw, 1996, p.516). According to this definition, such a disability thus affects specific aspects of the child's school performance, resulting in achievement, which is lower than would be expected considering such factors.

Cases of learning disabilities that are being identified in children are on the increase, and thus the prevalence rate is growing. Kolb and Whishaw (1996) estimate that approximately 10 to 15 percent of all children have diagnosable cases of learning disabilities of which only two percent have access to specialised education and support. Furthermore, it has been found that this disorder is almost twice as prevalent in boys as it is in girls (Kolb & Whishaw, 1996). As such learning disabilities encompass two broad types of disabilities; namely academic and non-academic learning disabilities. Academic learning disabilities include problems in areas of reading, writing, spelling and mathematics, and are as a result, the focus for this study. Whilst non-academic learning disabilities include problems in memory processes and language (Wong, 1996).

Of the learning disabilities that include problems in areas of reading, writing, spelling, dyslexia – particularly developmental dyslexia – dysgraphia and attention deficit hyperactivity disorder are key. It may now be beneficial to this research to discuss each of these three disorders in turn

2.2.1 Developmental dyslexia

As defined by the Research Group on Developmental Dyslexia of the World Foundation of Neurology (1970), *dyslexia* is "A disorder manifested by difficulty in learning to read despite conventional instruction, adequate intelligence, and socio-cultural opportunity. It is dependent upon fundamental cognitive disabilities which are frequently of constitutional origin" (Critchley, 1970, in Yule & Rutter, 1976, p.26). This disorder, that affects the child's development of literacy skills, is said to be prevalent in between 4 and 10% of school-aged children (Fletcher Et al., 1997).

Developmental dyslexia is characteristic of a difficulty with the reading of unfamiliar words, and may thus be assessed by asking the child to read a series of non-words that are phonetically regular (DeFries Et al., 1997, in Brady, 1997). Whilst the focus for dyslexia is thus on reading, and the difficulty to master such a task, another characteristic of such a disorder is the invariably severely impaired spelling ability of the dyslexic child (Seymour, 1984; Treiman, 1997).

2.2.2 Dysgraphia

Dysgraphia represents an impairment in a child's ability to acquire the skills to spell and write fluently, and may be defined as a condition in which familiar words can be spelt reasonably well, although non-words – or unfamiliar words - cannot be spelt correctly without significant difficulty (Eysenck & Keane, 2000). Thus, characteristic of this disorder is poor spelling, with errors that are commonly phonologically incorrect (Harris & Coltheart, 1986).

2.2.3 Attention deficit hyperactivity disorder

Attention deficit hyperactivity disorder (ADHD) is a disruptive behaviour disorder that has three distinctive features, namely: developmentally inappropriate levels of inattention, impulsivity and hyperactivity (Kendall & Hammen, 1995). Westen (1999) argues that all children with this disorder have disturbances in each of these three areas to differing degrees, stating that in extreme cases "a child may be in perpetual motion – running, jumping, disrupting activities, or picking fights with other children" (p.688).

In order to be diagnosed as having ADHD the child needs to meet the following criteria as set up by the Diagnostic and Statistical Manual of Mental Disorders Fourth Edition – revised text - (American Psychiatric Association, 2000):

- developmentally extreme symptoms in any or all of the inattention, hyperactivity and impulsivity areas,
- which are of early onset (i.e. before the age of seven),
- having lasted for a duration of at least six months,
- be pervasive and
- impairing.

The prevalence of ADHD is estimated at 3 to 5% of school-aged children and is found to be four to nine times more prevalent in boys than in girls (Westen, 1999). Although children with ADHD usually exhibit symptoms by the age of four, the disorder often goes unrecognised until the young child enters school, since children are not usually required to comply with stringent social demands before that time (Campbell, 1985). As such, ADHD is strongly related to school problems and

academic underachievement as is evident in their underachievement in reading, writing and spelling in comparison with age related norms (Hinshaw & Zalecki, 2001).

With the prevalence rate growing, theories about the etiology of learning disorders – in its multiple forms – "assume a diverse and complex origin, and include genetic, neurobiological, and environmental factors" (Barlow & Durand, 2001, p.445). Despite the vast amounts of research conducted on this topic though, no consensus has been reached as to the exact role that each of these factors has played in the development of problems related to this heterogeneous group of disorders. In fact, there is no known behavioural or biological marker that may predict the incidence of a particular learning disability (Kolb & Whishaw, 1996), and furthermore, although postulated to be genetically transferable, this appears to be true only for some forms of dyslexia (Barlow & Durand, 2001). Additional studies have shown that other biological dimensions such as prenatal, perinatal, and neonatal complications are highly correlated with the incidence of learning disabilities (Kolb & Whishaw, 1996). However, once again this is only found to be accurate for certain types of this disability, and thus more research is definitely required to dispel the confusion as to the exact etiology of such a developmentally frustrating disorder.

Whilst this etiology is being researched however, it has been found that the most successful treatment of a learning disability (barring attention deficit/hyperactivity disorder, which requires biological treatment) is that of an educational intervention (Barlow & Durand, 2001). Such educational efforts, may – as Barlow and Durand (2001) point out – be broadly categorised into:

a. efforts to directly remediate the underlying basic processing of problems;
b. efforts to improve cognitive skills through general instruction in listening, comprehension and memory; and
c. targeting the behavioural skills needed to compensate for specific problems the student may have with reading, mathematics, or written expression. (p. 447)

Whilst certain children respond differently to each of these three broad categories of remediation, generally, the schooling years of the child with a learning disability are clouded with frustration and tears. With it known that learning disabilities in the areas of reading, writing and spelling account for a large majority of all cases of learning disabilities (Wong, 1996), it may now be appropriate to look at each of these complex tasks in turn.

2.3 Reading, Writing and Spelling

Reading, writing and spelling all involve complex cognitive processes (Sternberg, 1996). Thus with difficulties in these areas accounting for a large majority of all diagnosed cases of learning disabilities (Wong, 1996), it may be suggested that the propensity to have a learning disability is intrinsic to the individual's cognitive processes (Bergenstein & Tergerman, 1991).

2.3.1 Reading

Reading may be defined as "the ability to extract visual information from the page and comprehend the meaning of the text" (Rayner & Pollatsek, 1989, p.23). In order to accomplish this though the reader requires a number of skills, namely letter

identification skills, phonological skills, grapheme skills, sequencing skills, as well as short-term memory (Sternberg, 1996).

As such, reading is an incredibly complex task, that at minimum involves language, attention, memory, thinking, intelligence, as well as perception (Sternberg, 1996). For without language the words would stare back meaninglessly, without attention the words, letters and features that symbolise the sentence would dance around the page incoherently, without memory the meaning would be completely lost, and without perception reading would be impossible. Despite this complexity, in our modern society reading is fundamental to our everyday lives, and although no simple task, the human cognitive system can readily cope with the demands associated with reading.

Reading has however, not always been a fundamental part of everyday activities, nor has it always been a common skill for the majority of the population (Hampton & Morris, 1998). It has only become so over the past century or so and prior to that was reserved for the elite few that were fortunate enough to learn. It may thus be seen that, unlike verbal communication, which is an inherently natural ability that humans are genetically predisposed to, reading is a social invention that must be learnt at a conscious level and that it remains a difficult skill to master (Liberman, 1996 in Shaywitz, 1996).

With its relatively short history as an accessible medium of communication for the masses, reading has in recent years become the subject of intensive psychological study (Carrol, 1986). Despite this constant research and debate and despite the general consensus amongst theorists that reading is a highly complex behaviour

involving multiple processes and stages, our understanding of reading is still sadly limited (Funnel, 2000; Hampton & Morris, 1998). With this in mind, it may now be appropriate to explore the various models that have been proposed to explain the cognitive processes involved in reading. In doing so attention will be given to the debate regarding the primary importance of visual as opposed to phonological coding in the reading of words and visa versa, as well as the importance of proposed top-down and bottom-up approaches in skilled reading.

2.3.1.1 Skilled reading

Johnson and McClelland (1980, in Ellis, 1993) proposed a model of reading that suggested a bottom-up approach to the recognition of words. According to bottom-up approaches it is theorised that there is an initial focus on the perception of the physical or environmental stimulus. Following this, the systematically proceeding upwards - in a hierarchical manner - until the involvement of higher order cognitive processes necessary for the performance of the task or skill may be considered (Sternberg, 1999). Conversely, top-down approaches focus initially on the influence of higher-order cognitive processes, existing knowledge and the impact of this existing knowledge on expectation. Following this is only when top-down models believe the involvement of sensory data such as the perceptual stimuli is considered (Sternberg, 1999). In this regard then, Johnson and McClelland (1980, in Ellis, 1993) in their bottom-up approach to reading, proposed what was to become an influential model of the visual word-recognition system. This model hypothesised that the perception of written language may be understood on a number of levels including at a letter-position pre-processing level, a feature detection level and abstract word detection level of processing (Ellis, 1993). Johnson and McClelland (1980, in Ellis, 1993)

stated that these levels operated in a hierarchical fashion with features being analysed first, prior to letter analysis, and by extension letters being analysed before words.

In simple terms then, what this model argued for was that in order for us to read a single word, the stimulus word must first be segregated into letters based on their ordinal position in the word. Following this, each position is then analysed for its constituent features and then through feature analysis various potential corresponding letters that have similar features are activated whilst those with dissimilar features are inhibited. At this level of the letter, the correct letter, which corresponds to the stimulus, is activated and the remainder are inhibited. Active letter detectors are then said to excite word detectors that function in a similar manner by inhibiting words that do not have letters at the specific ordinal positions and activating those that do. The word is thus only recognised at the word level through the combined activation of several letter detectors. According to the Johnson and McClelland model (1980, in Ellis, 1993), the letter and word detectors are referred to as being abstract as they are useful in the identification of letters and words regardless of their exact visual form. In this way the reader is able to correctly match letters as well as the word with the stimulus even though it may be presented in a wide array of typestyles, typefaces, forms and cases (Sternberg, 1996). Lastly then, it is once the word is then finally recognised that its spelling, pronunciation and meaning become available to the reader (Carrol, 1986; Ellis, 1993; Harris & Coltheart, 1988).

Cognitive neuroscience provided the evidence for the role of features in the visual detection of letters and thus for this bottom-up approach to reading. This evidence came in the form of an experiment stated by Neiser (1963, in Carrol, 1986) that

involved an experimental task whereby participants were asked to search through an array of letters for a specific target letter. Findings of this experiment illustrated that detection times were faster when the array of letters were compromised of letters with different features, and slower detection times for those where the array had similar features to the target letter. This then suggests that letters are identified from a number of features, and depending on the letters constituting the array, with the number of features needed for identification being smaller when the letters are dissimilar and conversely needing more features when the letters are similar (Neiser, 1963, in Carrol, 1986).

Further support for the role of features in the visual detection of letters is provided by physiological studies on cats. In these experiments Hubel and Wielsel (1962, 1963, 1965, in Carrol, 1968; Sternberg, 1999) illustrated that certain cells, which are present in the visual cortex of cats, are selectively responsive to visual stimulation such as vertical or horizontal lines, as well as edges. As such the similarity between the nervous systems of cats and that of humans is thought to make it likely that we too have similar cells that serve as feature detectors. This analogy to the human nervous system has however been highly criticised and as a result is still only speculative at present (Carrol, 1986).

Additional experiments explained by Harris and Coltheart (1986) and Adams (1990), have shown that when letters or words are presented for a very brief period only, participants are often able to correctly state what the letter or word shown was. Despite getting this correct though, participants are unlikely to be able to report whether it was written in upper or lower case. This finding thus supports the theory

of the existence of abstract letter and word detectors as stated by Johnson and McClelland (1980). The problem with such a finding on the other hand though is that the dissimilarity that exists between many upper and lower case letters (e.g. A and a) indicates just how unclear the Johnson and McClelland model is with regards to how feature detectors and abstract letter detectors are linked together (Adams, 1990).

Reading, however, does not only involve the identification of features, letters and words, but in addition to this visual recognition, reading also involves the mastery of lexical processing. Thus one requires the ability to identify the letters and words as well as to activate relevant information in memory related to these words so that one may comprehend or make sense out of the text as a whole (Pearsons & Stephens, 1992). In this regard, learning to read involves the mastery of skills that include general comprehension skills, which are already inherent in verbal language use, as well as skills specific to written language that include: the extraction of visual features of letters and words, the use of saccadic eye movements, as well as the relating of the written language to its spoken form in some manner or other (Snowling, Goulandris & Stackhouse, 1996). Bearing this in mind, Rumelhart and McClelland (1981, 1982, in Ruddel & Unrau, 1994) proposed an interactive activation model of visual word recognition.

The interactive model, as suggested by Rumelhart and McClelland (1981, 1982, in Ruddel & Unrau, 1994) hypothesises that activation of particular lexical elements occur at multiple levels and that the activities at these level are interactive. Similar to the Johnson and McClelland model (1980, in Ellis, 1993), Rumelhart and McClelland (1981, 1982, in Ruddel & Unrau, 1994) distinguished between three levels of

processing of text following visual input. These levels being, the feature level, the letter level and lastly, the word level. Conversely to the Johnson and McClelland model (1980) however, this interactive model assumes that information is represented separately in memory at each level, and that information passes from one level to the next in a bi-directional manner. As such this model incorporates both the bottom-up as well as the top-down approach to processing, with top-down processing commencing with high level cognitive processes functioning on prior knowledge and related experiences to the given context (Sternberg, 1999).

This model thus takes the influence of the word superiority effect into consideration as it explains that known features about words are also able to facilitate the identification of letters. Supporting this statement, experiments conducted by Reicher and Wheeler (1969, 1970, in Harris & Coltheart, 1986), found that words comprising of four letters were reported more accurately than single letters when presented in a rapid and automated manner. This finding remained constant even when the researchers utilised a forced choice technique to minimise guessing, thereby providing evidence for the word superiority effect.

It is reported that many theorists currently view visual perception in terms of information processing based on the interactive activation model (Basic Behavioural Science Task Force of the National Advisory Mental Health Council, 1996). Through this it is hypothesised that as words are combined to form sentences and sentences paragraphs, a similar process and influence of context occurs at higher levels. Thus knowledge of what a paragraph comprises, for example, may facilitate the processing of information at lower levels, such as at the level of meaning of each sentence.

Following this, Rumelhart and McClelland (1981, 1982, in Ruddel & Unrau, 1994) propose that these computations take place very rapidly and unconsciously.

The interactive model has been computer simulated, and thereby instead of using serial processing, makes use of the parallel processing of information and in this way permits the flow of information in both a bottom-up and top-down manner. The performance of these computer simulations being noted as resembling the ability of readers in perceiving words.

Despite the interactive activation models popularity, however, as with the Johnson and McClelland model (1980, in Ellis, 1993) it was not without criticism and aspects of this model were found to not coincide with evidence from other experiments. According to both of these models, letters are coded according to their exact location in the visual field. Contrary to this belief though, evidence suggests that the coding of letters is instead based on their relative position and not their precise location in words. In this regard, McClelland and Mozer (1986, in Eysenck & Keane, 2000) found that spoonerisms could occur in similar pairs of words. For example words such as ‘dune’ and ‘ junk’ could sometimes be misread as ‘dunk’ and ‘June’. In addition, according to the interactive activation model, the word superiority effect should have been significantly greater for words with a high frequency than for those with a lower frequency. This occurring due to the increased top-down activation from the word level to the letter level resulting in stronger connections and higher resting activation levels for these high-frequency words. In reality however, it has been illustrated experimentally, by Gunther, Gfoerer and Weiss (1984, in Eysenck &

Keane, 2000), that the word superiority effect is the same for both high and low frequency words.

Bearing these issues in mind and realising that the original interactive activation model was deterministic in nature and as a result failed to take into account the inherent and unavoidable variability of human performance, McClelland further developed the model in 1993 (Eysenck & Keane, 2000). This model of McClelland (1993, in Eysenck & Keane, 2000) included variable processes that thus were said to enable the model to simulate the distributions of responses of human participants on various word-recognition tasks.

Despite these changes however, all the models proposed by McClelland over the years (namely the Johnson and McClelland model (1980), the McClelland and Rumelhart model (1981, 1982), as well as the McClelland model (1993)) are based on the assumption that lexical access is determined first by the perception of visual information. This is then followed with a secondary emphasis being placed on the semantic properties only in the interactive activation models (Ellis, 1993; Eysenck & Keane, 2000; Ruddel & Unrau, 1994). Much controversy and debate however exists in this regard, with other theorists arguing that in reading, phonological coding is instead nearly always used prior to lexical access (Frost, 1988, in Adams, 1990).

In this primary importance of phonological coding approach then, in order to read it is believed that the reader must be able to transform the visual precepts of alphabetic script into linguistic precepts. Thus the reader needs to recode the graphemes into their corresponding phonemes, and integral to this task is a conscious awareness of

the internal phonological structure of spoken words, as well as an understanding that the orthography used by the language is representative of that phonology (Ehri, 1980; Ruddel & Unrau, 1994).

In this regard, research conducted in 1994 by Shaywitz, Pugh, Todd, Constable, Fulbright and Gore (Shaywitz, 1996), suggested a tentative neural architecture for the reading of text. This research highlighted the multiple cognitive processes and findings indicated that the identification of letters activated sites in the extrastriate cortex in the occipital lobe, access to meaning areas in the middle and superior temporal gyri of the brain, and phonological processing areas in the inferior frontal gyrus.

From a cognitive neuropsychological standpoint then, and returning to the visual analysis system, the triple-route model was proposed by Ellis and Young in 1988. This triple-route model (1988, in Ellis, Matthew, Lambon, Morris and Hunter, 2000; Eysenck, 1995) being based upon components identified by Ellis and Young through their study of acquired dyslexia, proposes three routes between the printed word and speech (Eysenck, 1995), and is considered to provide a good account of both normal as well as brain-damaged reading and suggests that normal readers utilise all three routes when reading.

According to this model, Ellis and Young (in Ellis Et al., 2000; Eysenck, 1995) hypothesise that Route 1 makes use of grapheme-phoneme conversion in the pronunciation of unfamiliar words or non-words. With grapheme-phoneme conversion functioning by analogy with words whose pronunciation is known and as

such translating letters or letter clusters into phonemes by the application of rules. Individuals who are thus considered most strongly to adhere to this route in their reading are those that have been diagnosed as suffering from surface dyslexia. This form of dyslexia referring specifically to the difficulty experienced in the reading of irregular words (Ellis Et al., 2000). However, experiments discussed in Seymour (1992) have indicated though that suffers of surface dyslexia are able to pronounce some irregular words, thus suggesting that Route 1 is not exclusively adhered to.

The route most typically utilised by adult readers, as suggested by Ellis and Young (1988, in Ellis Et al., 2000), is Route 2. At this level it is proposed that adult readers have a multitude of familiar words stored in their visual input lexicon that may become activated following visual representations of a word. Following this, it is proposed that the meaning of the word is obtained from the semantic system after which point the word can be spoken. According to this model, suffers of phonological dyslexia, which affects the reading of unfamiliar as well as non-words, are believed to use Route 2 (Eysenck & Kane, 2000). In addition to this, people diagnosed with deep dyslexia – people inclined to battle with the reading of unfamiliar words and who often make semantic reading errors – also appear to mainly use Route 2 because of their inability to use grapheme-phoneme conversion effectively (Ellis & Young, 1988, in Ellis Et al., 2000; Seymour, 1992).

Lastly, Route 3 resembles Route 2 in that the visual input lexicon and the speech output lexicon are involved in the reading process. The difference between the two routes being evident in that the semantic system is bypassed in Route 3, with printed

words being possible to pronounce but not understand and unfamiliar and non-words being difficult to pronounce (Eysenck & Keane, 2000).

According to this triple route model, it was originally assumed that the two main routes to reading, namely the lexical and the non-lexical routes are independent of each other (Ellis Et al., 2000). Subsequent studies have however provided evidence that suggests that the two routes are interrelated and not independent as originally believed (Snowling, Goulandris & Stackhouse, 1996). In this regard, Plaut (1996, in Eysenck & Keane, 2000) – in contrast to this belief of Ellis and Young (1988) – proposed a connectionist approach to the reading and pronunciation of both regular and irregular words. By this Plaut assumed that the pronunciation of these words were based on a highly interactive system and not on that of three non-interactive routes. Plaut (1996, in Eysenck & Keane, 2000) thus argued that words vary in their consistency or extent to which their pronunciation agrees with that of similarly spelt words, and accordingly, suggested that highly consistent words could generally be pronounced faster and more accurately than inconsistent words. This he attributed to the notion that there would be more knowledge available to the reader that would support the correct pronunciation of the highly consistent words. Plaut's hypothesis is supported by the findings of a study conducted in 1979 by Glushko (Eysenck & Keane, 2000), that found that word naming was generally predicted better by consistency rather than regularity of spelling.

Despite emphasising the importance of grapheme-phoneme coding in the reading of unfamiliar or non-words via Route 1, the triple route model of reading still remains primarily visually based. Accordingly the model considers the reading performance

of normal individuals to on average be affected by their phonological coding by only a very small degree (Adams, 1990). This, according to the Ellis and Young model (1988, in Ellis Et al., 2000), is because reading via Route 1 (also referred to as the indirect route), which uses phonemes, tends to be slower than via the direct route (i.e. Route 2), both routes being thought to be unrelated as previously mentioned. However, as also previously mentioned, Frost (1980, in Carrol, 1986) has argued that the importance of phonological coding is much greater in skilled reading than that implied by the triple route model. Frost has thus instead postulated that phonological coding will occur even to the detriment of the actual performance of the task and that furthermore, this form of coding will inevitably occur even when a word is presented to a reader for only a brief period (Eysenck & Keane, 2000).

Evidence does exist to support the importance of phonological coding in skilled reading, and comes in the form of an experiment conducted by Tzelgov in 1996 (Eysenck & Keane, 2000). For this experiment participants – who were bilingual speakers – were required to name the colour of words presented to them in one of their two languages with each of the non-words for a specific language actually being the phonological translation of a colour name in the other language. Findings reported by Tzelgov indicated a slowing down of the reader's ability to read the names of the colours when the words themselves were printed in a colour different to their colour names. This suggests that participants were engaging in phonological coding of the non-words, even though by doing this they were hampering their ability to read the words efficiently and fluently (Sternberg, 1999).

Whilst it is thus obvious that there is evidence to support the phonological model of skilled reading, the exact influence, as well as the role of phonology in this regard remains poorly understood. Despite this lack of understanding though, the phonological model is criticised as being limited in that it does not account for all the processes that continual research is illustrating to be involved in the highly complex activity of reading. Furthermore, this model does not appear to successfully account for the symptomology of the various types of dyslexics, even though it appears to provide a better account of reading for normal individuals (Eysenck & Keane, 2000).

2.3.2 Spelling

Spelling, which is often mistakenly considered to be the reverse process of reading (Frith, 1980), is equally complex in its own right. It requires, not only simultaneous integration of syntactic, phonological, morphological, semantic and orthographic knowledge, but also an exact memory for letter patterns and words (Birsh, 1999).

As noted by Trieman (1997; 1998), in comparison to the large body of research focusing primarily on reading (as seen in the previous section), the study of spelling has to date been relatively neglected. Despite this, spelling is as complex as reading and also at minimum involves language, attention, memory, thinking, intelligence, as well as perception (Sternberg, 1996). Interestingly though, studies conducted by Moats (1995), cited in Carreker (1999), indicate that it is rare for a child that has difficulty with reading to not have difficulty with spelling as well. However, it is possible for a fairly good reader to have problems with spelling. This may suggest the true complexity involved in mastering the task of becoming a good speller and thus highlights the need to explore this area in further detail.

Despite this void of carefully researched information, the complexity of spelling may be illustrated through a discussion on the distinctiveness of spelling and what is involved in this task for one to become skilled at spelling.

2.3.2.1 Skilled spelling

"In order to spell, the speller must translate spoken words into printed symbols. To each speech sound in a spoken word, the speller must attach a written letter or letters. In this manner the speller can represent spoken words with printed symbols" (Carreker, 1999). Whilst so basically put, the reality of representing spoken words with printed symbols requires the explicitly taught instruction regarding the language structure for spelling and an active engaging in thinking about language (Birsh, 1999).

The speller needs to rely on a phonological awareness in order to segment the desired word into its constituent sounds. Following this the speller then needs to determine how these sounds are best represented in print, a confusing task due to the multiple spellings that represent many speech sounds in English. The speller may only confirm that the correct choice has been made based on a comparison between the spelled word and with a word held in memory as contextual cues that are successfully used in reading are no longer helpful with spelling (Fulk & Stormont-Spurgin, 1995). If the necessary word is however not held in memory or if the speller has a poor memory for letters and words, it becomes difficult for the speller to independently confirm that the spelling choice is correct. "Spelling [thus] requires an awareness of and an exact memory for letter patterns and words that reading does not require" (Birsh, 1999, p.218).

In addition to the need for an exact recall of letter patterns, and an awareness of the ambiguities of the sound-to-sound spelling translations, spelling is a complex linguistic skill that demands simultaneous integration of syntactic, phonological, morphological, semantic, and orthographic knowledge (Bryant, Nunes & Bindman, 1997; Frith, 1980; Moats; 1995).

- *Syntactic knowledge* refers to the role the word will have in the sentence and alerts the speller that the desired word is either an adverb, adjective, verb or noun. By doing this, the speller may be aware of nuances regarding the word and it's correct spelling, for example if the word desired is a verb it will have a tense that may impact on the spelling.
- *Phonological knowledge* allows the speller to be aware of all the sounds present in the word and react accordingly. *Phonology* refers to the system of rules and patterns that govern the utterance of speech sounds that make up spoken words in a particular language (Moats, 1995). Based on this system of rules, there are constrains about sound sequences in spoken language and these rely directly on what humans are capable of producing with relative ease. By knowing what sound sequences are difficult to produce helps the speller know that certain letter sequences would thus not be correct (Carreker, 1999). Related with this is *phonetics*, which refers to the study of the characteristics of individual speech sounds that occur in languages. With regard to English, there are approximately 44 speech sounds with some variants of these sounds that are not considered separate speech sounds (Carreker, 1999). "Phonetics involves the categorisation or description of the articulation of each speech sound – where the sound is produced, the way in which air stream flows

through the mouth and nose, and the activity of the vocal cords during production" (Carreker, 1999, p.223). A knowledge of this, thus allows the speller to correctly spell the word by 'mouthing' it (Moats, 1995). *Phonics* then refers to the instructional method that teaches the use of written symbols to represent speech sounds for spelling and reading and provides a visual representation of the phonology of spoken language.

- *Morphological knowledge* refers to a knowledge about morphemes, which are the smallest units of language that carry meaning, such as prefixes, suffixes, roots, and combination forms. By having such a knowledge the speller may advance from the spelling of one-syllable base words to the spelling of one-syllable base words with suffixes and in this way, eventually to the spelling of other derivatives and multi-syllabic words (Carreker, 1999). In this manner, morphemes serve not only as meaning-filled units but also as spelling units that may clarify spelling choices and allow the speller to contend with more complex levels of orthography (Birsh, 1999).
- *Semantic knowledge* indicates an awareness of the meaning of the word and it's constituent morphemes. For example through semantic knowledge, the speller will know that [ed] placed at the end of a word will denote past tense.
- *Orthographic knowledge* refers to the knowledge of the rules that govern how words are represented in writing. With this knowledge, the speller's task is to determine how the phonemes of spoken language may be transcribed into written language (Carreker, 1999). Included in this knowledge is a set of constraints that may be present in that particular language's orthography, which are called to attention through formal spelling instruction and that help establish a sense of the frequency and reliability of letter patterns (Birsh,

1999). For example, in English, such constraints include – certain letters never double (e.g. *j, y, w*); certain letters do not occur in sequence (e.g. *skr*); and words do not end in certain letters (e.g. *v, j*) (Brady & Moats, 1997). In order to be a successfully skilled speller, the knowledge of the most frequent and reliable orthographic patterns as seen by these constraints is thus essential.

2.3.3 Writing

The processes involved in writing appear to have been relatively neglected by psychological researchers compared to reading and spelling. Despite this, writing is often considered to be the most challenging skill to master, as it requires a combination of all the processes involved in both reading and spelling (Birsh, 1999).

Within each area – namely reading, writing, and spelling – it is thus seen that complex sets of cognitive processes are all crucial to the successful execution of these tasks. Luria (1973) suggests that reading, writing and spelling are based on the relationship of increasingly complex neurological zones (Jansen, 1996), while Piaget (Piaget & Inhelder, 1971) suggests that these processes, as with other symbolic systems involved in intelligence and thought, draw on perception, imagery, language and memory.

Many other cognitive theorists also stress the importance of imagery as a system. Sternberg (1996), for example, suggests that the primary cognitive processes involved in knowledge representation are sensation, attention, perception, imagery, language and memory. Imagery is thus viewed as an important mode of cognitive processing. Theorists are, however, divided as to whether imagery as a form of information

processing is distinct from the types of information processing involved in representing words and symbols in the mind (Sternberg, 1996).

2.4 Learning Disabilities as Disturbance or Immaturity in Cognitive Functioning

Considering the complex cognitive nature of reading, writing and spelling, from a cognitive perspective a learning disability may be conceptualised as a breakdown in external function, implying difficulties in the cognitive systems, which underpin external functioning. As such the difficulty may be related to one or more of the cognitive processes on which knowledge representation is based. Disturbance or immaturity in one or more of these areas, may in turn hinder consequent steps in the learning process and as a result compromises the entire task ability (Luria, 1973; Silver, 1992).

Research has illustrated however, that the child with the learning disability often has the capacity to develop compensatory strategies (Reid, 1981, as cited in Sigel et. al, 1981). Such research is compatible with Piaget's theory of cognitive development, which suggests that perception, imagery and language are separate systems which underpin thinking (Piaget & Inhelder, 1971). Each of these systems has the capacity to develop over the whole of the human life span.

2.5 The Theories of Piaget

Piagetian constructivism is based on the belief that knowledge is a construction. As such, that learning disabled children can construct knowledge and in this way

assimilate and accommodate experiences (Piaget, as cited in Wadsworth, 1971). In this manner, Piaget believed that the child is an active builder of knowledge and not merely an object that receives information from the world.

Furthermore, Piaget studied imagery extensively in children, concluding that images are similar to language as they both have symbolic properties. He noted that whilst images designate concrete objects in terms of their perceptual and figurative properties, words signify concepts (Piaget, 1950). By implication then, Piaget recognised the potential that mental imagery had in the development of cognition in the child, and its possible contribution to mental activity as well as complex mental functioning (Moerk, 1977, in Potter, 2003).

2.6 Imagery

As defined in the Oxford dictionary (Pearsall, 1999), an *image* may be understood to be a mental representation of something that is not currently being directly perceived but rather that which is in the imagination or in memory. By extension then, *imagery* refers to visual images collectively (Pearsall, 1999). "Investigations of mental imagery can be traced back over more than 2500 years, they were an important part of the earliest attempt to devise a scientific psychology in the 19th century, and they were at the forefront of the initial development of cognitive psychology in the 1960's" (Richardson, 1997, p.1).

Research into imagery does not however, constitute a single homogeneous field. In fact research into this field may be classified into four main clusters or ideas. These

being – imagery as a personal or phenomenal experience; imagery as a mental or internal representation; imagery as a stimulus attribute; and lastly, imagery as a mnemonic or cognitive strategy (Richardson, 1997).

2.6.1 Imagery as a phenomenal experience

Mental imagery is in essence a subjective experience – one may never be able to experience exactly the same image, nor may one be able to view another's image (Richardson, 1997). As a result, exploration of other peoples' images relies on that person's verbal account of what they experience rather than on the basis of their observable non-verbal behaviour as there is simply no natural expression that corresponds to having an image (Quinton, 1973).

2.6.2 Imagery as an internal representation

As an internal representation, images are said to have certain functional properties that should enable them to be useful in a wide range of cognitive tasks – particularly in spatial thinking and remembering (Richardson, 1997). In such research it was found that imagined objects, events or scenes are structurally equivalent to the physical objects, events or scenes that they represent. Furthermore, it was found that images may be compared and manipulated in a manner that is analogous to the way in which real objects, events or scenes are compared and manipulated (Denis & Cocude, 1997; Harris, 1978; Linn & Peterson; 1985; Lorenz & Neisser, 1985). Thus, as discussed by Richardson (1997), "the use of imagery as an internal representation appears to depend upon a system of visuo-spatial working memory which contains a passive store or visual buffer in which images can be constructed on the basis of

information about the physical appearance of objects, events, and scenes that is held within long-term memory" (p.139).

2.6.3 Imagery as a stimulus attribute

This area of research explored the idea that "materials or stimuli which people encounter in psychological research vary in the ease and the speed with which they evoke imagery" (Richardson, 1997, p.77). For example, experimental questionnaires found that a word such as 'elephant' tended to arouse mental images relatively quickly and easily, whilst a word such as 'fact' would only arouse images with difficulty or perhaps would not evoke an image at all. By extension, high-imagery items are considered better remembered than low-imagery items (Friendly, Franklin, Hoffman & Rubin, 1982; Paivio, Yule & Madigan, 1968). According to Richardson (1997) this appears to be specifically related to the use of imagery as a visuo-spatial working memory and it can therefore not be attributed to purely linguistic properties of the items used in such experimental tasks.

2.6.4 Imagery as a mnemonic strategy

This area of research explores the idea that mental imagery can serve as an effective strategy for remembering new information. Based on findings from numerous experiments, Richardson (1997) reports that "the use of imagery is associated with relatively high levels of performance" (p.139). Thus, training in the use of imagery as a mnemonic strategy enabling one to manipulate images does have benefits, however it's effectiveness is reported to depend on the demands of the learning task and the nature of the material being learnt (Richardson, 1997).

Currently there is still a great deal of uncertainty regarding where exactly in the human brain imagery is controlled. Until recently, it was widely assumed that imagery was based upon a single mechanism in the brain, and that this mechanism was housed in the right cerebral hemisphere (Richardson, 1997). However, in exploring the above four research areas it soon became clear that imagery was a complex system of interrelating components. Based on this notion, Kosslyn (1980) suggested that one should not assume that there is necessarily one single structure causally responsible for imagery, but rather that distinct components may well be physically separated and distributed at different sites across the brain.

Studies of split-brain patients and patients with lesions indicate some tendency toward hemispheric specialisation however, in which visuo-spatial information may be processed primarily in the right hemisphere, and linguistic information in the left hemisphere of right-handed individuals (Sternberg, 1996). Interestingly though, studies of normal subjects indicate that visual-perceptual tasks seem to involve regions of the brain similar to the regions involved in visual-imagery tasks (Farah, Hammond, Levine & Calvanio, 1988). This then has implications for the other senses and their related types of imagery.

These different forms of imagery including:

- Auditory imagery
- Visual imagery
- Kinaesthetic imagery
- Synaesthesia
- Eidetic imagery (Potter, 2003, p.7).

2.7 The Theoretical basis of the Targeted Revisualisation Programme

The Targeted Revisualisation Programme employs the use of mental imagery to help develop abilities in children with learning disabilities (Potter, 2003). In this regard, the Targeted Revisualisation Programme is based on Piagetian theory. It conceptualises reading, writing and spelling as symbolic process which are based on underlying integrates in perception, imagery, language and memory.

The high spatial competence of many children with learning difficulties has been commented on by a number of writers (e.g. Bannatyne, 1971; 1973; Eccles, 1966; Hecaen & Ajuiaguerra, 1964; Penfield & Roberts, 1959; Sperry, 1964). The programme builds on these spatial competencies through the use of multi-sensory teaching, and activities involving mental imagery (as set up by Fernald, 1943; Jaensch, 1930). Thus, as the programme draws on the child's capacities in mental imagery in particular, and uses these to assist in the development of the other cognitive processes, which underpin learning to read, write and spell, the programme aims to build on existing verbal and spatial integrates.

In common with the remedial methodologies proposed by Fernald (1943), the programme is based on use of high imagery teaching techniques and the use of mental imagery to help develop the reading, writing and spelling abilities of children with learning disabilities. In addition to using Piaget's theories of mental imagery as a basis for developing mental recall, the programme's procedures are based on Luria's theory of the neuropsychological basis of learning, as well as the theories of Frith,

Bryant and Bradley and other cognitive theorists of how sounds and letters are used to form words in English (Potter, 2003).

2.8 The Theories of Luria

Luria's theory is based on a belief that ~

> Mental functions such as writing and spelling are complex functional systems, which cannot be localised in narrow zones of the cortex or in isolated cell groups. In contrast, complex mental functions are better conceptualised as organised in systems of concertedly working zones of the brain, each of which performs a role in the complex functional system.
>
> (Luria, 1973 as stated in Potter, 2003, p.1)

The Targeted Revisualisation Programme is based on Luria's theories in conceptualising reading, writing, as well as spelling as complex integrative tasks involving both simultaneous and successive processing. Tasks are thus designed to develop integrated functioning, as a basis for the concerted working of a number of functional zones on a neurological level. In terms of this conceptualisation, the programme is based on a view that remediation of such difficulties require an approach to teaching that focuses on establishing basic skills, memory integrates and integrative functions (Potter, 2001).

These abilities being developed by the programme "in the context of the complex system of rules used in the orthography of the English language" (Potter, 2001, p.1).

To facilitate this acquisition of skills and abilities the Targeted Revisualisation Programme uses multi-sensory techniques. This is based on research which indicates that memory can be of many different types (Sternberg, 1996). By using a number of different types of tasks involving imagery, the likelihood is increased that different forms of memory can be developed, as the basis for more complex integration in reading, writing and spelling (Potter, 2003).

2.9 Memory

Memory may be defined as

> "the learning dependent storage of ontogenetically acquired information. This information integrates into phylogenetic neuronal structures selectively and with respect to the given species so that it can be retrieved at all times. This means that it can be provided for situation-dependent behaviour. Generally formulated, memory is based on conditioned changes of the transfer properties in neural nets so that under specific circumstances those system modifications that correspond to neuromotoric signals and behavioural tendencies become reproducible in full or partly"
>
> (Sinz, 1979 as cited in Markowitsch, 2003, p.725)

According to this definition then, in order to retain and access information in memory processing needs to occur at all of the following stages – registration; encoding; consolidation; storage; and retrieval. *Registration* refers to the initial perception and transfer to cortical routes. *Encoding* – the further initial processing of

information that involves either associating or binding. *Consolidation* referring to the deep encoding and embedding of information and the subsequent engram formation. *Storage* – the stable representation of information in the nervous system, and lastly, *Retrieval* being the reproduction or recall of information (Markowitsch, 2003).

Memory – in its full set of processing stages - may be sub-divided with respect to both time or the duration that the information will be stored in memory, and content of that being stored in memory. In terms of time or duration, three forms may be identified. These being sensory memory, short-term memory, and long-term memory. As defined by Sternberg (1996), sensory memory, which is also often referred to as iconic or echoic, retains information along the sensory channels for an extremely short period of between 50 and 500 milliseconds, and is the form of memory that enables us to perceive stimuli. Short-term memory retains information for longer that the sensory memory store, but still only has the capacity to range from a few seconds to a few minutes and is limited to a store of seven bits of information. Short-term memory is thus the online processing of information. Long-term memory provides the store for principally lifelong retention of information and is seemingly limitless in its capacity (Sternberg, 1996).

In sub-dividing memory in terms of content then, five basic groups may be identified (Markowitsch, 2003). The first being episodic memory, which includes the context-embedded autobiographical memory that allows for mental time travelling. Second, the declarative memory store, which includes the storage of context-free information such as memory for facts and knowledge systems. The third type of memory is

procedural memory, and includes the memory for skills, rules and sequences. The fourth sub-type regards priming, where the likelihood of re-identifying previously perceived stimuli is heightened the more that particular memory is activated and thus the stronger the neural pathway to that memory becomes. Lastly, the fifth subtype of memory based on content, groups all other forms of memory not previously mentioned and includes lower forms of memory such as sensitisation or classical conditioning (Markowitsch, 2003).

The brain processes memory from the initial stages of information registration to it's storage and retrieval, but both the time and content dimensions of memory mentioned above, interact in the exact neural processing of information (Markowitsch, 2003). This complicating the exact description of the neural pathways, circuits and networks implicated in information processing. Despite this complication, regardless the time or content, memory as a cognitive function is a complex system that relies on all areas of the brain to function at an optimal level (Lynch, 1998).

2.9.1 Multisensory teaching and memory

The term *multisensory teaching* refers to any learning activity that includes the use of two or more sensory modalities simultaneously to assimilate and learn or to express information (Birsh, 1999). By doing so, it is hypothesised that the learner's ability to learn and recall information is facilitated and memory is reinforced (Birsh, 1999).

Although not commonly endorsed by teachers other than those working with children struggling with learning disorders, the notion of multisensory teaching has an

extensive and long history. In fact, throughout the 19th and 20th century, educators and psychologists have promoted the idea that learning experienced through all of the senses is helpful in reinforcing memory and that thus, all of the senses are important to learning (Birsh, 1999).

For children who are learning disabled, the idea of better memory organisation, neural activation patterns in language processing and the importance of meta-cognitions that are consistent with the efficacy of multisensory teaching techniques (Moats & Farrell, 2000), have aided the alleviation of the difficult and trying experience that learning embodies.

With the Targeted Revisualisation Programme using such multisensory techniques one may thus appreciate the results of the programme that to date have been encouraging (Potter, 2003). This suggesting that the Targeted Revisualisation Programme's procedures could perhaps benefit children – particularly those children with a learning disability who have shown little responsiveness to other forms of remediation.

2.10 Summary

This chapter has illustrated how the Targeted Revisualisation Programme ties in with the related theoretical assumptions that allow it to be applied to children with learning disabilities. It was seen that the term learning disability is an umbrella term that includes a number of different forms of learning problems and that as a disorder it is complex, with often devastating consequences on the developing child's confidence

and self-esteem. With learning disabilities in the areas of reading, writing and spelling accounting for a large majority of all diagnosed cases, the Targeted Revisualisation Programme – which addresses these areas – was thus shown to have great potential in easing the frustration that such a child experiences.

The complexity of reading, spelling and writing was illustrated. Following which, the Targeted Revisualisation Programme, which employs the use of mental imagery to help develop abilities in children with learning disabilities, was discussed, as well as the related theoretical assumptions. Through this discussion it was found that the programmes procedures are based predominantly on the following three theories –

1. Piaget's theory of how recall imagery is used by the child in learning to read, write and spell, or in failing to learn to read, write and spell;
2. Luria's theory of the neuropsychological basis of learning; and
3. A theory of how sounds and letters are used to form words in English.

(Potter, 2003, p.1)

Knowing the theoretical basis of the programme, how memory works, as well as being equipped with the knowledge of how learning disabilities may be intrinsic to the child's cognitive functioning, it may now be beneficial to move on to the next chapter. The third chapter will discuss the methodology that this research has followed in its quest to establish a link between mental imagery and memory and explore the effectiveness of the Targeted Revisualisation Programme on improving the reading, writing and spelling abilities of grade four children with learning disabilities.

Chapter 3: Methodology

This study has addressed the research questions outlined in Chapter One, using the following methodology:

3.1 Data Collection

3.1.1 Sample and sampling

The sample consisted of eight fourth grade children (two girls and six boys) who were receiving full-time remedial education at Japari Remedial School. All eight of these children had been diagnosed as having learning difficulties in the areas of reading, writing, and spelling and as a result fell within the population of children with learning difficulties that the Targeted Revisualisation Programme is addressing.

The children were selected with the guidance of the school's principal and relevant staff members. This was done on the basis of the child's current abilities in reading, writing, and spelling, as well as their poor responsiveness to other techniques of remediation. The sample strategy employed may thus have been considered quota, non-probability sampling, which was appropriate because the children were selected from a particular category for the purposes of this study and probability sampling would thus not have been effective in this regard.

After this selection process, only those children whose parents consented were included in the study. These children were then paired by roughly matching them in terms of their intelligent quotient. These pairs were then split as the children in each

were randomly assigned to either an experimental group or a contrast group. The experimental group received tutoring for six months using the Targeted Revisualisation Programme, whilst the contrast group received tutoring (of the same duration) using traditional remedial techniques.

Although the sample size of eight was rather small, it was appropriate to this research, because this study was looking at detailed case studies of each child in each respective group and thus was primarily of a qualitative nature.

3.1.2 Procedure of data gathering and observation

The methodology of the research was based primarily on a qualitative methodology and in particular made use of the aggregative case-survey method. In terms of this methodology, data collection was undertaken in such as way as to enable the researcher to examine each case study individually and then combine all the case studies and look at the results in combination.

This involved a procedure in which tutoring and testing were done on an individual level. After data collection was completed, all eight case studies were analysed separately. The results were then aggregated through a process involving identification of common trends and differences. These findings were then clustered and aggregated to form conclusions.

3.1.3 Measures and instruments

The records of each child were obtained from the school, and in this way the child's most recent intelligence test score was accessed. These scores included those on the

Wechsler Intelligence Scale – Third edition, or the Senior South African Individual Scale – Revised. Each child then, irrespective of the condition assigned to, received standardised pre-testing and post testing of their reading, writing and spelling abilities using the following instruments ~

- ✧ The Holborn Reading Scale
- ✧ The Schonell One Word Spelling Test
- ✧ The Schonell Word Reading Scale
- ✧ The Schonell Graded Dictation tests (forms B, C, and D)
- ✧ The Phonic Inventories
- ✧ The Regular and Irregular Reading test and the Words and Non-words reading test

In addition to these tests written samples of their work were analysed once before the intervention and once after the intervention, in order to assess creative writing. Furthermore, each child's ability to use mental imagery was explored by using the Galton's 'Breakfast-table' questionnaire. This questionnaire was then supplemented by requesting each child to participate in a semi-structured interview, with questions standardised in the form of an Imagery Questionnaire.

The Rey Complex Figure was used to assess learning and memory and in addition to this the cognitive processing abilities (in particular each child's visual memory) was explored using the following tests:

- Relevant sub-scales from Durrell Analysis of Reading Difficulty (3rd Edition) in the form of the oral reading, silent reading, spelling, and visual memory of words sub-scales
- The Kaufman Assessment Battery for Children

Biographical history and other relevant information was also obtained through the completion of a Parental Questionnaire (refer to Appendix D) so that a detailed case study could be compiled for each participant. Lastly then, each child's teacher was given a questionnaire to complete (refer to Appendix E) allowing for the potential to add other pertinent information to the case studies.

The Wechsler Intelligence Scale – Third Edition (WISC-III)

The Wechsler Intelligence scale – third edition, developed in 1991, is organised into verbal and performance subtests, and is intended for children between the ages of six and seventeen (Anastasi & Uubina, 1997). It has a high reliability of .96 for the verbal sub-test and .91 for its performance scale, as well as a high content validity, and illustrates a high predictor validity (Wechsler, 1991). As the instrument has not – as of yet – been adapted for the South African population though, the British version was used in this study.

The Senior South African Individual Scale – Revised (SSAIS-R)

The Senior South African Individual Scale – Revised is the South African equivalent of the Wechsler Intelligence scale for Children – Revised, and consists of verbal and non-verbal subtests that are aimed at primary school level children. This test is standardised on the South African population and yields a high validity.

The Holborn Reading Scale (refer to Appendix F)

The Holborn Reading Scale, which consists of 33 sentences arranged in order of increasing difficulty with respect to mechanical elements and comprehension, is

widely used in clinical work with children. Each sentence in this test represents a reading age, and between each sentence there is a difference of three months. In administering the test, the child is given the sheet with the sentences and asked to read aloud from the top. Following the fourth mistake he or she is stopped and their corresponding reading age determined from the figures in the margin opposite the sentence that was last read (Buros, 1959).

"The scale thus enables the tester to make a rough assessment of a child's reading level in a remarkably short time and without calculations" (Buros, 1959, p.736). Despite the fact that this test has limited statistical significance it is clinically significant (Buros, 1959) and as a result is a valuable measure in the study. Furthermore the scale has been normalised to both British and South African samples and therefore is an unbiased scale for this study.

The Schonell Tests (refer to Appendix G)

The Schonell Tests are all graded tests that are widely used in clinical work with children and although normed on British samples, are widely used in South Africa. The grading has been checked by teachers and by reference to written material of children ages seven to eleven (Schonell, 1974), and the words included in the tests are thus said to be common words which elementary school children use in writing and which all children of average intelligence are supposed to be able to spell (Schonell, 1974). These tests are used to access the ability of both children in normal schools as well as those in remedial schools yet little psychometric information is known.

The Schonell One Word Spelling Test ~

This test provides an estimate of the child's attainment in spelling and is administered by first dictating each word, placing this word in a short sentence, and then repeating the word (Schonell & Schonell, 1958). The child is required to write down each word and then this list of words is marked with the aim of determining the number of words that the child is able to spell correctly. From this number of correctly spelt words the child's spelling age can be determined using the following formula –

$$\text{Spelling Age} = \frac{\text{number of words correctly spelt}}{10} + 5 \text{ years}$$

The Schonell Word Reading Scale ~

This test represents a scientifically selected sample of words of increasing difficulty that give an accurate estimate of a child's level of word recognition, and from which reading age can be calculated (Schonell & Schonell, 1958). In administering the test, the child is given the test sheet and asked to read each word as it appears across the page aloud. The examiner then records the responses on a separate sheet. This record is then used to determine the number of words correctly read. Once this number has been obtained the child's reading age may be determined from the following formula

$$\text{Reading Age} = \frac{\text{number of words correctly read}}{10} + 5 \text{ years}$$

The Schonell Graded Dictation Tests ~

These tests offer an estimate of the child's ability to write continuous material (Schonell, 1977), and reveal particular errors characteristic of many classroom writing activities. In administering the tests, the passage is read aloud to the child in order to

provide an indication of the paragraphs meaning. Following this, the paragraph is dictated to the child in short phrases of three to four words. The passage is then marked and the number of all errors calculated. Using this number of errors a positive score is found by reference to table one. It should be noted though, that if the number of errors exceeds 25, the test is deemed too difficult and the child's performance is then based on a previous level (Schonell, 1977). The positive score is then used in reference to table two in order to determine the equivalent spelling age.

The Phonic Inventories (refer to Appendix H)

The Phonic Inventories are word spelling tests that consist of three levels (Potter, 2001), where each level's results are tabulated on an error analysis sheet enabling error clusters to be observed so that such patterns of errors may then form the target areas for remediation. In this manner, these inventories not only allow the remediation received to be specific to each child's needs, but also provide a tool that may measure what has been learnt, as well as illustrate "what still needs to be done in terms of developing a child's level of competence in the basic skills of reading, writing and spelling" (Potter, 2001, p.5).

In administering the test, each word is read out loud by the tester, embedded in a short sentence, and then read again. The child is then asked to write the word down. Once each level has been completed in this manner the tester is then able to analyse each word for integrates and errors, as well as draw out, cluster and tally patterns of errors and their positions in the words.

The Phonic Inventories are specifically used for diagnostic purposes at the outset of the Targeted Revisualisation Programme in order to establish which phonic rules have been learnt by a particular child, as well as which rules are not yet established. These inventories reflect three types of rule systems, namely, those relating to the use of short vowels with the beginning and ending blends, those surrounding the use of vowel digraphs, and lastly, those involving the use of multiple syllables, prefixes and morphological endings in words (Potter, 2003). Each rule system forms the basis for a specific level of the Phonic Inventories.

The Regular and Irregular Reading and the Words and Non-words Reading test

(refer to Appendix I)

Both tests - developed by Dr. Yvonne Broom - aim to explore the strategies that are lacking which are involved in reading phonetically. The Regular and Irregular Reading test includes 40 regular words whose graphemes conformed to their most common pronunciation and 40 irregular words whose pronunciation was not readily predictable from their graphemes. These words were selected to ensure that half had high frequency of occurrence and the other had a low frequency of occurrence (Broom, 1991). The Words and Non-words Reading test consists of 32 words and matched to these words in terms of frequency of occurrence and syllable length 32 non-words were developed from these (Broom, 1991). For both tests, words that were used had been selected from Carrol, Davies and Richman (1971) based on relevant criteria (Broom, 1991).

Galton's 'Breakfast-table' Questionnaire (refer to Appendix J)

The objective of this questionnaire is to elicit the degree and quality by which different people are able to use mental imagery (Richardson, 1997). The majority of the questions are explicitly concerned with visual imagery, and all allow the respondent to describe their mental experience in their own words.

The Imagery Questionnaire (refer to Appendix K)

The Imagery Questionnaire is a semi-structured response interview, which aims at describing how each individual child utilises imagery in the process of learning words. The questions asked are directly linked to the Targeted Revisualisation Programme, and in this way, the responses may be used to inform the programme, and thus, inform the development of the child's reading, writing and spelling abilities.

Rey Complex Figure (refer to Appendix L)

This test is widely used in neuropsychological assessment for the evaluation of visual perception, drawing, constructional praxis, and visual memory. Participants are asked to copy the diagram three times – once with a copy of the figure in front of them, a second time from memory as an immediate recall trial and the third time also from memory as a delayed recall trial. The immediate recall trial and the delayed recall trial allowing for a comparison of short- and long-term retention.

Durrell Analysis of Reading Difficulty (3rd Edition)

The basic service of the Durrell is in the systematic observation of reading skills and habits. As such it consists of a series of tests and situations that facilitate detailed

observations of the various aspects of reading, and covers a range in reading ability from non-readers to approximately the sixth grade (Durrell & Catterson, 1980).

Furthermore, the Durrell has sub-scales that specifically explore the child's visual-memory of words, thus making it relevant to both the exploration of memory and reading abilities in this research.

Kaufman Assessment Battery for Children (K-ABC)

The K-ABC is designed as a clinical instrument for assessing cognitive development. This test is an individually administered measure of intelligence and achievement and has been standardised on a large sample of normal and exceptional American children ages two-and-a-half to twelve-and-a-half. The K-ABC is a multi-subtest battery and yields standard scores in the following four areas: Sequential Processing, Simultaneous Processing, Mental Processing Composite, and Achievement (Kaufman, 1985). Using the specific sub-scales, which target memory particularly the Hand Movements, Number recall, Word Order and Spatial Memory sub-tests, the test offers valuable information relevant to this research.

3.2 Data Analysis

Following the data collection – which ran over the six-month period and involved pre- and post-testing - the researcher was able to examine each case study individually and then combine all the case studies and look at the results in combination.

The writing up of each case study was facilitated by the biographical questionnaire that was given to the parents and the teacher questionnaire given to the class teacher, which allowed the researcher access to each child's developmental experiences as well as the child's social and familial history. This information being useful in the detailed analysis of each individual case history. Each child's scholastic history and their latest IQ scores were then accessed through their school records and the findings from these furnished the case history of each subject as well as a discussion on each child's performance on the specific intelligence tests.

Each tutor also kept a diary of each child's day to day development. This contained information on the child's level of concentration during remedial sessions, the tasks and exercises completed as well as their performance. These diaries were detailed and allowed extraneous variables to be noted, whilst also providing a description of the remediation received by each child. With it known from this source the manner in which each child had been taught as well as their response to such teaching, the case study of each child could contain a portfolio of remediation that had been done.

3.2.1 Analysis of writing abilities

The diaries also served the purpose of containing the subjective impressions of each tutor on their student's creative writing and development thereof. Creative writing was further analysed by comparing the written samples of each child's work once before the intervention and once after the intervention. Writing – as seen by that in dictation – was then measured based on the gains on the Schonell Graded Dictation Tests as these are said to be a useful measure of contextual and integrative spelling as well as writing abilities.

3.2.2 Analysis of spelling abilities

Spelling abilities were analysed using the Schonell One Word Spelling Test, the Schonell Graded Dictations, as well as the Phonic Inventories. The results of these tests provided information on the child's one word spelling, contextual spelling, as well as information on their patterns of errors respectively. Regarding the two Schonell spelling tests (namely the One Word Spelling and the Graded Dictations), the difference between pre- and post-test performance was calculated and a gain in the post-test was considered an improvement of spelling ability as a result of the teaching. The Phonic Inventories on the other hand, were used initially to determine the child's pattern of errors needing to be targeted in remedial sessions. The diaries then demonstrated what had in fact been targeted, and as a post-test these inventories then illustrated what had been learnt by the child and highlighted the rules that the child still needed to acquire.

3.2.3 Analysis of reading abilities

One word reading was assessed using the Schonell Word Reading Scale, and the Holborn Reading Scale determined contextual reading. The results of these were also analysed in conjunction with what was noted in the day to day developmental diaries, and it was assumed that an increase in the number of words correctly read in the Schonell test and the number of sentences correctly read in Holborn test indicated an improvement in reading ability as a result of the teaching. The Regular and Irregular and the Words and Non-words reading test was then used to determine the reading strategies that each child still needs to develop in terms of reading phonetically.

3.2.4 Analysis of each child's ability to use mental imagery as a learning aid

Diaries of the day to day development of each child were also integrated with the findings of the Imagery Questionnaire. This was done by qualitatively analysing and comparing the findings as reported by each child in this semi-structured interview with information on how the children had been taught. The Galton 'Breakfast-table' Questionnaire gave a further indication of the degree of detail and vividness of the child's imagery and the ease with which they can form images in general.

3.2.5 Analysis of each child's memory ability in relation to the use of mental imagery

Memory (in particular each child's visual memory) was explored using ~
the Rey Complex Figure, sub-scales from the Durrell (Third edition), the Kaufman Assessment Battery for Children.

3.3 Summary

This chapter discussed the methodology that this research followed. It was thus seen that this study was primarily of a qualitative nature and that it particularly involved the aggregative case study method. The sample and sampling strategy was also mentioned and the battery of tests that were used was outlined. In conclusion this chapter explained the method of data analysis and discussed which tests were used to measure which constructs. Furthermore, it was mentioned that diaries of day to day development were kept so that the findings of the pre and post-testing could be integrated with information on how the children had been taught. With the

knowledge of how the data was gathered and analysed it may now be useful to move on to the next chapter that will deal with the results of each child in the study.

Chapter 4: Results

4.1 Case-by-Case Analyses

4.1.1 Experimental group: analysis of Child A (Refer to Appendix M)

Case History

Child A is a girl who was born on the 3rd of September 1993, and is eleven years old. Her only sibling, a brother two years her senior, has also been diagnosed with a learning disability, and it is said that the two get along very well with only the regular occasions of sibling rivalry being noted by her parents. Child A's parents are still married and are described by Child A as supportive when needed, but sometimes distant, with Child A often expressing that she would like her family to be closer and a more nurturing unit.

Child A's medical history illustrates that birthing conditions were not optimal with complications - including the umbilical cord being around her neck twice – necessitating the need for an emergency caesarean delivery at 36 weeks. Despite this traumatic entrance into the world, Child A illustrated a normal development, reaching most developmental milestones at appropriate ages, and aside from having to have grommets inserted and contracting chicken-pox, displayed good health growing up. It should however be noted that developmentally, Child A spoke late, and regarding her health, suffers from headaches since attending school. Her eyesight is as a result checked regularly but to date Child A is not experiencing any eye problems.

With both her parents working, Child A was sent to play groups from a very young age. Once old enough, Child A was then enrolled at St Mary's School, where during grade 0 concerns started to mount as Child A would not be able to sit still or concentrate. Physiotherapy was recommended to which Child A went for the next few years. By this time, Child A was in grade 3 and clearly not coping with reading and spelling despite remedial support, speech therapy, and occupational therapy. As a result Child A was taken for a full assessment, which revealed that Child A had ADHD and was as a result placed on Ritalin. During this assessment it was found that Child A had difficulties in crossing the midline, and that emotionally she was maturing at an age appropriate rate. This assessment report formed the motivation for Child A's acceptance into Japari in the middle of the grade 3 year, where Child A is now progressing slowly but steadily.

Child A has a positive attitude towards school and tries very hard to do well, feeling inadequate when she perceives to have done badly. Art classes are Child A's favourite and extramurally, Child A excels, participating in swimming, athletics, gymnastics and drama. Child A also does well at ice-skating, plays the piano and does modelling, which she is said to love.

Child A has many friends both at school and out, and has been described as confident, friendly and finds it easy to socialise. She has a few close friends and is very independent. Child A has a good relationship with her teacher and is said to be respectful.

Imagery Questionnaires and Memory

Child A reported that she could clearly see a word in her mind, using the procedures she learnt from the Targeted Revisualisation Programme. Child A stated that this was however only, provided she had at some stage studied and visualised the word. The image was most often in pink and written in a form of 'bubble writing' but was bold and large. Accompanying this image was that of an image of what the word represented. For example the word flower would appear with the image of flowers next to it. After saying the word Child A was still able to see the image but once spelt, the images of that that was signified would disappear and the letters of the word would 'pop'.

According to Child A she was able to recall the image to memory again by merely saying it but would only use this procedure when writing those words she was having difficulty spelling. In all other instances Child A found the words would normally just come out and thus she would not try and get an image for every word. If the word was written down incorrectly or spelt incorrectly, Child A stated that she could tell because it just 'looked wrong'. Following this she was able to check words written against those that she had mental representations of.

Regarding words in passages, Child A reports merely 'seeing' the words as they lie together on the page, but does also indicate that she sees images of what the words are representing next to these words.

Regarding her mental imagery in general, as explored by the Galton's 'Breakfast-table' questionnaire, Child A is able to see vivid images. Reporting that by

revisualising her breakfast experience she is able to see everything clearly and accurately, as well as taste and smell the food and hear her family talking around her.

Regarding visual memory Child A improved in both short-term and long-term retention ability as indicated by her results on the Rey Complex Figure test. Here it was seen that Child A was able to improve her immediate recall image by 2.5 points and improve her delayed recall image by 4 points, still remaining in the 50th percentile on the age norms chart. Regarding memory in relation to performance on the specific sub-scales of the Kaufman Assessment Battery for Children that were used, Child A also showed an improvement in her memory abilities. This indicating that she responded favourably to the high imagery training received from the programme.

Intelligence Tests

Child A was assessed using the WISC-III intelligence test in the February of 2003. The results of this indicate that Child A has a Total IQ in the average range relative to the WISC-III norms. Her Verbal Scale IQ is in the low average range, and her Non-Verbal IQ is in the average range.

Durell Analysis of Reading Difficulty (3rd Edition)

Child A improved on the Durell Analysis of Reading Difficulty test in all sub-scales administered. Regarding oral reading at the pre-test level she was unable to score as she fell outside all the time norms, however at the post test level it was found that Child A read at a lower grade 2 level, with her comprehension also improving from fair to good. This was also true for silent reading, where Child A improved from not being able to score to a middle grade 2 level. Regarding phonetic spelling a similar

pattern was also observed with Child A initially not scoring at a pre-test level but scoring a middle grade 6 range at post testing. On the visual memory of words sub-scale, Child A improved from a grade 1 level to a mid grade 3 level indicating an increase in visual memory ability.

Scholastic Test Results

Child A's results may be summarised by the following table:

Table 1 - Summary of results

	Gained Scale Score	**Gained Raw Score**
Holborn Reading Scale	8 months	3
Schonell One Word Reading Scale		-6
Schonell One Word Spelling Test		-1
Schonell Graded Dictation Test B	Positive score increase of 6	5
Schonell Graded Dictation Test C	Positive score increase of 2	2
Schonell Graded Dictation Test D	Positive score increase of /	4

<u>Gained Scores:</u>

Child A has shown a variation in her tests results, with some indicating that she has made no significant change, whilst others indicate that she has made some

improvement. Her reading, as measured by the Holborn Reading Scale, illustrates an improvement of approximately eight months. It was noted though that Child A relies on context to read. Thus it is not surprisingly then that she performed better on the sentence reading of the Holborn than he did on the Schonell One Word Reading Scale, where she showed no improvement. Regarding her spelling, Child A illustrated little to no improvement as seen by her results on the Schonell One Word Spelling Test, which indicates that she stayed more or less the same at pre and post-test levels. Child A however, displayed a little improvement in her dictation results as seen by the three Graded Dictation tests of Schonell that were administered. On Test B of the Graded Dictation she made five less errors in the post-test and minor improvements in the other forms of this test. Thus giving her a spelling age of approximately seven years (although the exact scores falling outside the norm tables and hence not being able to be calculated accurately).

As such it is possible to see that Child A has made worthy improvements in both dictation as well as sentence reading, but that her one word reading and one word spelling need to be targeted further in order for her to improve in these areas.

Phonic Inventories

Analysis of Child A's Phonic Inventories, at the beginning and at the end of the study, indicate that on Level 1 Child A made 6 fewer errors concerning ending blends and clusters, as well as fewer vowel length confusions and sound confusion errors. The number of medial vowel errors, however increasing by 1 error. On Level 2 she made an improvement regarding initial consonants, medial vowels and vowel length confusions, as well as ending reversals and transposals, but displayed a greater

number of errors relating to medial vowel digraphs and ending blends and consonants in the post-test than she did in the pre-test. Child A made her greatest improvement on Level 3 though, which indicates an improvement with regards to suffixes and syllabification errors and also fewer errors on medial vowels, vowel length confusions, sound confusions and reversals and transposals in her post-test than in her pre-test. With these improvements however it was also noted that Child A made more errors with her ending blends in her post-test and thus that this area remains one that is in need for further remediation and targeting.

Regular and Irregular Reading and Words and Non-words Reading tests

Analysis of Child A's Regular and Irregular Reading test indicates that of the 72,5 % of the regular words that she was able to get correct, 15 were classified as having a high frequency of occurrence and the other 14 had a low frequency of occurrence. Of the irregular words, Child A was able to correctly read 70% of all words, with 14 of these being of high frequency of occurrence and 8 having a low frequency. Analysis of her errors indicates difficulty with regards to medial vowels, as well as with ending blends and consonants. Regarding the Words and Non-words Reading test. Child A was able to read 59% of all 'Words' correctly, with 11 of these words being of high frequency of occurrence and 8 being low frequency words. Furthermore, Child A read 59% of all 'Non-words' correctly, of which 10 were high frequency and 9 were low frequency of occurrence. Again it was noted through the analysis of her errors that Child A has difficulty with medial vowels, vowel digraphs, as well as with ending blends and consonants.

Portfolio

Child A received tutoring for the duration of the six-month period using the Targeted Revisualisation Programme. Throughout this time she was reported as being friendly and hardworking, but following the session reports it appears that she was also rather talkative. Child A is reported to have concentrated fairly well and would follow instructions carefully, initially needing a lot of encouragement that she was doing things correctly but gaining confidence and slowly becoming more independent in her tasks towards the end of the study.

Child A's writing was initially rather poor and she needed a large amount of encouragement in order to write a paragraph that made sense and followed any structure or form. Towards the end of the study it was reported that Child A would write longer and better quality paragraphs with very little help. However, it was noted that – although more descriptive – Child A would shy away from using words that she was not sure how to spell, instead using the words she was confident with and would thus talk in circles to reach her point.

Child A did seem to respond to the Targeted Revisualisation Programme and was able to form mental images of words that she could work from. Child A's tutor reports working from level one of the programme and continuing methodologically through levels two and three, and only managing to just introduce activities on level four before the end of the study. It was noted – in running the programme in this way - that Child A would sometimes become bored and as a result would start jabbering about other issues. She did seem to enjoy colour coding the vowels and revisualising the words, but hated doing so on the computer. Child A's tutor was dedicated and

thus made colourful magnetised letters, which Child A could place on the board and revisualise from there. With a fair amount of time spent reading from books of Child A's choice, Child A is reported to have looked forward to her sessions and was always keen to do such tasks.

4.1.2 Experimental group: analysis of Child B (Refer to Appendix N)

Case History

Child B is a boy who was born on the 8th of April 1994, and is ten years old. His only sibling – a brother – is two years his junior and was apparently born a twin but apparently due to complications the twin did not survive. This, resulting in significant trauma for the whole family especially Child B, who at the time was only two and did not understand what was happening. Child B lives with both his parents who report being happily married and who seem supportive.

Child B's medical history illustrates that although birthing conditions were normal, Child B was born with jaundice, thus needing to be under the light for his first two days. For the first six months, Child B had colic, and it is reported by Child B's mother that this impacted on her already severe post partum depression (that she was being medicated for) and made 'bonding difficult'. At two months Child B further contracted measles but this is reported as only having been mildly. Child B underwent a tonsillectomy at age two, and contracted chickenpox at age three. In grade 0, Child B was hospitalised again after he contracted viral encephalitis and reportedly took 12 weeks to fully recover. Child B contracted viral encephalitis again in grade 1 but this time only mildly and no complications were noted.

Regarding early schooling, Child B entered grade 1 being able to read a little but during the year went backwards losing the ability to read at all. Child B's mother describes his introduction into schooling at this first school as being 'disastrous' and blames the teacher's negative attitude for the majority of Child B's emotional scars. In the third term of this grade 1-year, Child B was moved to St John's Preparatory school, where he stayed until the end of his grade 3-year. By this stage it was noted that Child B was slipping further and further behind with his reading despite doing special remedial work and attending speech therapy, and following a psychological assessment was enrolled into Japari. The psychological assessment indicated that Child B was underachieving because of his emotional maturity being well below his chronological age. Furthermore it was suggested that his lack of academic risk taking and his fear of failure have built up mental blocks regarding Child B's academic work. Since attending Japari and going for play therapy to boost his self-confidence and address his anxiety, Child B has made slow yet steady progress. His strengths being in Mathematics, as well as most sporting activities.

Child B has a positive attitude towards school, and tries his very best to do as well as his brother who is described by his mother as 'bright as a button', and stresses when he does not achieve as well as hoped. Child B does exceed his brother's abilities on the sports field though and excels at Rugby, Tennis and Swimming. According to his mother, Child B appears to have a problem with phonics because 'no matter how hard he tries he still does not seem to recognise the basics of reading'. It is this problem with reading that the majority of his other scholastic difficulties (which are

predominantly of a reading and spelling nature) are as a result. These problems have been attempted to remediate through additional reading therapy.

Child B has many friends and is generally well liked but fears losing these friends and being alone. Child B has a good relationship with his current teacher and is said to be well disciplined and attentive in class. At home, Child B is said to be envious and threatened by his brother, and strongly dependent on his mother. Child B's mother has a history of a learning disability, but both parents are said to be supportive and have a close relationship with Child B.

Imagery Questionnaires and Memory

Child B reported that he could see an image of a word in his mind and that this image was clear with some words being bolder than others depending on his certainty of its spelling. The image always appeared on a black background and was reported to be written in white with the vowels sometimes colour-coded. Child B stated that having said the word or spelt it out loud, the image would disappear rather quickly, fading and becoming smaller until it was no longer visible but indicated that he was able to regain the image (in exactly the same form) if he concentrated.

Regarding words in a passage, Child B reports an ability to see an image of the words as they follow in succession. The words are still written in white and on a black background in these situations and initially are equally as clear. Child B does report tiring quickly this way, with the image becoming more and more hazy the longer he works and the more tired he becomes.

When it comes to writing down words from their image, Child B reports that the image sometimes does not remain long enough for him to complete the word – particularly with difficult words - and thus often when writing, the word just comes out. But if he cannot spell it he tries sounding the word out and if he gets it correct it usually 'looks right' and can tell the difference between incorrect and correct words because if a word does not match his image it then 'feels wrong'. When the word is spelt incorrectly in his image, Child B is unable to see the difference.

Regarding his mental imagery in general, as explored by the Galton's 'Breakfast-table' questionnaire, Child B is able to see clear images. Reporting that by revisualising his breakfast experience he is able to see everyone's faces and most things clearly with distinct colours and being confident that he would be able to draw the scene from memory.

Regarding visual memory Child B improved slightly in both short-term and long-term retention ability as indicated by his results on the Rey Complex Figure test. Here it was seen that Child B was able to improve his immediate recall image by 1 point and improve his delayed recall image by 0.5 points. It should be noted however, that regarding the copy trial, Child B reproduced the image perfectly in the pre-test situation but only scored 22 points at the post test level thus placing him in the 25th percentile on the age norms chart. Despite this inferior copy trial at the post test level Child B did improve his recall images (which were higher scoring than his copy image). Regarding memory in relation to performance on the specific sub-scales of the Kaufman Assessment Battery for Children that were used, Child B also showed an

improvement in his memory abilities. This indicating that he responded favourably to the high imagery training received from the programme.

Intelligence Tests

Child B was assessed using the WISC-III intelligence test in the May of 2003. The results of this indicate that Child B has a Total IQ in the mid average range relative to the WISC-III norms. His Verbal Scale IQ is in the low average range, and his Non-Verbal IQ is in the high average range.

Durell Analysis of Reading Difficulty (3rd Edition)

Child B improved on the Durell Analysis of Reading Difficulty test in all sub-scales administered. Regarding oral reading at the pre-test level he scored within a lower grade 2 level, however at the post test level it was found that Child B had increased by a full grade reading at a lower grade 3 level, with his comprehension being good at both testing stages. This improvement was also true for silent reading, where Child B improved from scoring a lower grade 2 to scoring a lower grade 3. Regarding phonetic spelling a similar pattern was also observed with Child B initially scoring a middle grade 4 level at the pre-test but scoring a middle grade 5 range at post testing. On the visual memory of words sub-scale, Child B improved very slightly but remained at a mid grade 2 level indicating only a minor increase in visual memory ability based on this test.

Scholastic Test Results

Child B's results may be summarised by the following table:

Table 2 - Summary of results

	Gained Scale Score	**Gained Raw Score**
Holborn Reading Scale	1 year 7 months	7
Schonell One Word Reading Scale	3 months	4
Schonell One Word Spelling Test	5 months	5
Schonell Graded Dictation Test B		-2
Schonell Graded Dictation Test C	Stayed the same	Stayed the same
Schonell Graded Dictation Test D	Positive score increase of 1	2

Gained Scores:

Child B has shown an improvement in a large majority of his tests. His reading as measured by both the Holborn and Schonell One Word Reading Scale has improved. It is however noticeable that Child B relies on context to read and that thus his improvement on reading single words only improved by three months whilst his sentence reading – which allows him access to contexts – improved quite drastically by 1 year and 7 months.

Regarding his spelling, Child B has seemed to make no improvement particularly regarding spelling words in dictation, as seen by his results on the Schonell Graded Dictation tests where on Test B he made two more errors in the post test and Test C

where he stayed exactly the same. Child B did on the other hand display a slight improvement in his one word spelling results as seen by the Schonell One Word Spelling test. On this test Child B improved by five months.

As such it is possible to see that Child B made improvements in both spelling (one word spelling) and reading, but that his dictation needs further remediation.

The Phonic Inventories

An analysis of Child B's Phonic Inventories, comparing pre- and post-test scores, indicates that on Level 1 he made fewer errors regarding ending blends and clusters. It is also noted that he improved in his medial vowels and medial vowel digraphs, but remained the same on initial blends and made 1 more error in sound confusion in the post test situation. On Level 2 an improvement was made in all areas. Level 3 it could again be seen that Child B improved on his medial vowels and vowel digraphs. Child B also made less errors with suffixes in his post-test than he did in his pre-test.

Regular and Irregular Reading and Words and Non-words Reading tests

Analysis of Child B's Regular and Irregular Reading test indicates that of the 80 % of the regular words that he was able to get correct, 18 were classified as having a high frequency of occurrence and the other 14 had a low frequency of occurrence. Of the irregular words, Child B was able to correctly read 42.5% of all words, with 12 of these being of high frequency of occurrence and 5 having a low frequency. Analysis of his errors indicates difficulty with regards to medial vowels, as well as with ending blends and consonants. Regarding the Words and Non-words Reading test, Child B was able to read 75% of all 'Words' correctly, with 14 of these words being of high

frequency of occurrence and 10 being low frequency words. Furthermore, Child B read 47% of all 'Non-words' correctly, of which 9 were high frequency and 6 were low frequency of occurrence. Again it was noted through the analysis of his errors that Child B has difficulty with medial vowels, vowel digraphs, as well as with ending blends and consonants.

Portfolio

Child B received remediation using the Targeted Revisualisation Programme for a period of six months between the pre-testing and post-testing stages. He was a quiet and somewhat reserved child who always worked well and would follow instructions to the letter, always trying to please his tutor. Furthermore, Child B was said to be incredibly polite and friendly once comfortable with his tutor. Child B took the lessons very seriously and constantly set high goals for himself – becoming visibly upset if he made too many mistakes and quickly losing interest if he perceived tasks to be too difficult.

In the beginning of the study Child B's tutor worked through the levels of the programme methodologically but refused to focus on revisualisation. With Child B's increasing boredom and his clear lack of progress alarming his parents, his tutor was issued a warning and worked under supervision for several lessons. During this time a few of the initial sessions centred around Levels one and two, with Level three only being used very briefly. Child B responded favourably to the revisualisation aspect and described his images as clear. It was also noted during this time that Child B was developing an enthusiasm for creative writing, and as such a large majority of the later (unsupervised) sessions were used to centre around a combination of Level two

and Level four activities. This being done to provide variety and enhance Child B's enjoyment of what he was learning, in this way improving his skills and building up his remarkably low self esteem. Reading was also practised often during these later sessions, with Child B reportedly enjoying the story and loving drawing cartoons of what he had read.

It is noted that initially Child B would write stories and creative paragraphs consisting of very short sentences merely strung together. However, as his spelling showed improvement he gained the confidence to attempt longer, more descriptive sentences. Child B thus responded well to the Targeted Revisualisation Programme as he showed a remarkable recall with words learnt using the Targeted Revisualisation Programme and was even able to extend these principle words to the correct spelling of some others improving his spelling ability in this manner. It should however be noted that Child B's tutor, after working more appropriately after being under supervision, lost interest towards the end of the six months, becoming unreliable and disengaged during the post-testing period, thus Child B's scores may not be truly reflective of the remarkable difference in Child B's reading, spelling and writing as noticed by his parents and teacher.

4.1.3 Experimental group: analysis of Child C (Refer to Appendix O)

Case History

Child C is a boy who was born on the 15th of February 1994, and who is ten years old. He lives with both his parents who have remained married and his two brothers, and apparently is quite content.

His medical history indicates that he was born by caesarean and despite bad pneumonia and occasional high fevers, he experienced good health as a child. Furthermore, Child C's development – that could be recalled - was normal with him reaching his developmental milestones at appropriate ages.

It was only whilst Child C attended Nursery School that his mother picked up on the fact that he tended to shorten long words without them making sense and would often 'swallow' what he was saying. He was promptly sent to speech therapy and remained in therapy until the end of grade 1. Throughout grade 1 and grade 2, Child C attended school at Saint Stithians and although going for occupational therapy by this stage as well, made little progress and struggled compared to his brothers who were excelling. Child C had no long absences from school and his lagging in comparison to his brothers upset his parents who then enrolled Child C into Japari Remedial School from grade 3. His primary areas of difficulty are with English reading and spelling and he is making slow progress at Japari. In contrast to his difficulties, Child C excels in mathematics and is a medallist in Karate.

Child C has a good attitude towards school, particularly enjoying the extra murals offered such as swimming and hockey. He tries his best and becomes frustrated when he does not reach his often-high expectations. Currently Child C receives speech therapy.

Child C is well liked and has many friends both on and off the sports field. He has one particular friend whom he has been a friend with for a long time and he enjoys

spending time with this friend. Child C has a good relationship with his current teacher and is said to be courteous and quiet. Despite being constantly compared to his brothers, Child C is said to have a good strong relationship with both his brothers as well as his parents, receiving support and encouragement from them all.

Imagery Questionnaires and Memory

Despite working extensively on building his ability to use mental imagery based on the procedures learnt from the Targeted Revisualisation Programme, Child C reports being able to see an image of the word but with a large amount of effort and difficulty. He reports that the majority of the time he gets an image of a picture depicting the word with its spelling just coming to him and that it is only if he then concentrates much harder that he may sometimes be able to go beyond this image and see the word. The letters of the word that are seen by Child C reportedly being in white and appearing on a black background. Child C is able to maintain this image after he has said it or spelt it for as long as he wants. However this does make him extremely tired and the more tired he becomes the more the picture begins to fade.

Child C sees the image of the pictures represented by the words (depending on whether he knows the word or not) in succession when working with passages but is only able to do so if someone is reading with him and he is able to hear them. When it comes to writing, if Child C does not merely recall the spelling of a word he is able to see it in his mind as it would be spelt from sound and is able to write it down - sometimes correctly - from there. If the word is one that he has seen before, he can tell if it is spelt correctly at this stage because he reports that it just ‘looks different’.

However if he does not know the word he cannot tell whether it is correct or not as he does not know the difference.

Regarding his mental imagery in general, as explored by the Galton's 'Breakfast-table' questionnaire, Child C is able to see relatively clear images. Reporting that by revisualising his breakfast experience he is able to see most things clearly but is not able to hear, smell or taste anything. Child C reports that in order to see this he has to really think because most times he forgets breakfast by the time he reaches school and thus also needed a fair amount of prompting in order to answer this questionnaire.

Regarding visual memory Child C improved in both short-term and long-term retention ability as indicated by his results on the Rey Complex Figure test. Here it was seen that Child C was able to improve his immediate recall image by 2.5 points and improve his delayed recall image by 2.5 points, improving his copy trial to be included in the 50^{th} percentile on the age norms chart. This indicating that he responded favourably to the high imagery training received from the programme. It should be noted however, that Child C expressed a strong disliking to this test and remained uncooperative throughout both pre and post testing, thus his results may not be truly reflective of the gains made in this regard. Regarding memory in relation to performance on the specific sub-scales of the Kaufman Assessment Battery for Children that were used, Child C also showed an improvement in his memory abilities.

Intelligence Tests

Child C was assessed using the SSAIS-R intelligence test in the June of 2001. The results of this indicate that Child C has a Total IQ in the average range relative to the SSAIS-R norms. His Verbal Scale IQ is in the average range, and his Non-Verbal IQ is in the low average range.

Durell Analysis of Reading Difficulty (3rd Edition)

Child C improved on the Durell Analysis of Reading Difficulty test in all sub-scales administered. Regarding oral reading at the pre-test level he scored within a lower grade 2 level, however at the post test level it was found that Child B had increased by a full grade reading at a lower grade 3 level, with his comprehension being good at both testing stages. This improvement was also true for silent reading, where Child C improved from scoring a lower grade 2 to scoring a middle grade 2. Regarding phonetic spelling a similar pattern was also observed with Child C initially scoring a middle grade 3 level at the pre-test but scoring a middle grade 4 range at post testing. On the visual memory of words sub-scale, Child C improved from a mid grade 1 level to a mid grade 2 level indicating only an increase in visual memory ability based on this test.

Scholastic Test Results

Child C's results may be summarised by the following table:

Table 3 - Summary of results

	Gained Scale Score	**Gained Raw Score**
Holborn Reading Scale	1 year 2 months	5
Schonell One Word Reading Scale		-4
Schonell One Word Spelling Test	6 months	5
Schonell Graded Dictation Test B	Positive score increase of 5	5
Schonell Graded Dictation Test C		4
Schonell Graded Dictation Test D	Outside scoring range	2

Gained Scores:

Child C has shown an improvement in all but one of his tests. His reading, as measured by the Holborn Reading Scale, having improved most considerably with the results indicating a significant improvement of 1 year 2 months. Regarding his one word reading abilities, as tested by the Schonell One Word Reading test, Child C made four more errors in his post test than in the pre-test. This indicating that Child C relies on the context in order to read, hence explaining the increase in only his sentence reading.

Regarding his spelling, Child C has also improved, as seen by his results on the Schonell One Word Spelling Test, which indicates an improvement of approximately

6 months. Child C has also displayed an improvement in his dictation results as seen by the three Graded Dictation tests of Schonell that were administered. On Test B of the Graded Dictation he made the most improvement, making 5 less errors in the post-test. Thus bringing his spelling age from that well below seven years to seven years (although the exact scores falling outside the norm tables and hence not being able to be calculated accurately).

As such it is possible to see that Child C also made encouraging improvements in both spelling (single words as well as dictation) and reading sentences. However his one word reading will require further remediation.

Phonic Inventories

An analysis of Child C's pattern of errors on the Phonic Inventories, comparing pre-test and post-test scores, indicates that on Level 1, Child C made 9 fewer errors on the ending blends and clusters. Regarding errors made on initial blends of this level though, Child C made the same amount of errors in the post-test as on the pre-test. Level 2 on the other hand, did not illustrate such change with regard to ending blends and clusters, but instead showed no difference whatsoever, with Child C making the same amount of errors on both administrations of this level of the test. Regarding medial vowels, vowel digraphs, as well as vowel length confusions, fewer errors were noted in the post test than in the pre-test. Level 3 showed some difference regarding ending blends and clusters once again, with Child C making fewer errors on the post test, as well as less errors with suffixes after the six-month period. With these improvements, however, it was noted that Child C made more errors with

syllabification than was previously observed. Thus it is clearly evident that this area is in need of further remediation and targeting.

Regular and Irregular Reading and Words and Non-words Reading tests

Analysis of Child C's Regular and Irregular Reading test indicates that of the 52.5 % of the regular words that he was able to get correct, 12 were classified as having a high frequency of occurrence and the other 9 had a low frequency of occurrence. Of the irregular words, Child C was able to correctly read 40% of all words, with 15 of these being of high frequency of occurrence and 1 having a low frequency. Analysis of his errors indicates difficulty with regards to medial vowels, as well as with ending blends and consonants. Regarding the Words and Non-words Reading test, Child C was able to read 56% of all 'Words' correctly, with 13 of these words being of high frequency of occurrence and 5 being low frequency words. Furthermore, Child C read 25% of all 'Non-words' correctly, of which 6 were high frequency and 2 were low frequency of occurrence. Again it was noted through the analysis of his errors that Child C has difficulty with medial vowels, vowel digraphs, as well as with ending blends and consonants.

Portfolio

Child C received remediation of a six-month duration using the Targeted Revisualisation Programme. Throughout this time he was found to be fidgety and relatively uncooperative. He would enjoy talking about other things during lessons and would try to get out of as much work as possible but when given a task that he found he had to do would buckle down and finish it in the shortest amount of time possible. Child C often grew distracted and complained of boredom when working on

the computer and any other task much to the frustration of his tutor who was creative and very enthusiastic. Child C's tutor described her student as a 'little old man that looked upon her as some crazed manic for insinuating that lessons could be fun'. Furthermore, Child C hated having to colour-code his vowels as the only colour he professed to like was black and would thus refuse to use any colour other than different shades of black.

Despite his obvious disdain at attending lessons and having to colour-code his vowels, Child C did make progress. His writing in the beginning of the study consisted of three to five word sentences strung haphazardly together. Towards the end of the study this changed to longer, more descriptive sentences that were still strung haphazardly together. Often not making sense, his stories were difficult to follow and as a result he found it frustrating to read them. However, when writing more factual paragraphs on guns and knives – a topic that he loved and his only professed interest in the entire world - his writing would improve and flow better. These sentences still using the more descriptive language and trying different words.

Initially Child C found it exceptionally difficult to form mental images of the targeted words. With practice though, and with the training he received from the Targeted Revisualisation Programme, he eventually managed to form images, which he was able to work from for a short time before tiring. He thus responded to the programme and spent a large majority of the sessions dedicated to Level one and two activities. Child C's sessions were also often divided to accommodate reading practise, and it was found that provided he was reading something about guns and knives – fictitious or not – he would read exceptionally well and enjoy the task.

4.1.4 Experimental group: analysis of Child D (Refer to Appendix P)

Case History

Child D is a boy who was born on the 8th of September 1994, and who is ten years old. He is the oldest son of a family of two children and lives with both parents who are still married. According to his family he is a happy child and receives a large amount of support from all members of the family.

Child D's medical history illustrates that he suffered no unusual birthing conditions. Throughout his early childhood, Child D showed early development reaching certain milestones prematurely with only the usual childhood illnesses (chicken pox, measles and mumps) but otherwise displaying generally good health and optimal development in all cognitive areas. However, at age five, Child D was the victim of a violent crime, when he was in an attempted armed kidnapping – for which he received no counselling. Following this traumatic ordeal, it was noted that Child D regressed.

Child D attended school at King Edward Preparatory School until the end of the year in grade 0. His difficulties arose in this first year when he was found to be disruptive and unable to concentrate properly. He was referred to a psychologist who diagnosed him as being attention deficit disordered and thus was placed in Japari Remedial School. At this school Child D is said to be making progress but apparently places so much pressure on himself to succeed that he often fails at tasks becoming increasingly depressed after each of these instances.

His areas of difficulty being with learning subjects, aspects of maths, reading as well as spelling. According to Child D's mother, these difficulties arising from his difficulty concentrating and 'inability to take time to sit still and improve on these weaknesses'. Presently Child D is receiving additional help from the school and attends occupational therapy and speech therapy on a weekly basis. His strengths - on the other hand - including design and technology as well as all sporting activities. Child D takes part in numerous sporting activities at the school (soccer, cricket and athletics) and is also a member of a soccer club, doing well in whatever sport he tries, but particularly enjoying swimming and riding his bicycle.

Through all his sporting activities, Child D has made many friends and is a popular boy at school. He has maintained a best friendship though since grade 1 and enjoys spending time with him and all his other friends. He has a good relationship with his current teacher, and despite the normal sibling rivalry, has a good relationship with his sibling – whom his parents seem to compare him to a lot. This often making Child D feel reportedly unloved and lonely. The entire family however, shares a love for the outdoors as well as for animals and appears to spend time together bonding in this way.

Imagery Questionnaires and Memory

Child D reported that he could clearly see a word in his mind, using the procedures he learnt from the Targeted Revisualisation Programme. The images were usually bold, large and clear and on a white background. Depending on the form of the word he had initially revisualised, his mental image of the text was either in black or was in

colour but always had a small picture of what the word represented next to it. The entire image remaining for as long as is needed. Apparently the image never fades and can be recalled by saying the word again with the image of the word appearing as it was originally revisualised.

Regarding working with passages, Child D breaks the words up in his mind but this time the image runs across his mind and does not remain stationary as with single words. In this manner he can see the words in succession, as they appear adjacent to each other. All the images are again on a white background but are all only in black. As with the single words, he can keep the image for as long as he wants without it fading.

When writing words down from images though Child D is usually able to see if he has written it correctly or not. However, if he has revisualised the word incorrectly the image looks exactly the same as those, which he has done correctly, and as such Child D cannot tell the difference.

Regarding his mental imagery in general, as explored by the Galton's 'Breakfast-table' questionnaire, Child D is able to see vivid images. Reporting that by revisualising his breakfast experience he is able to see everything and everyone clearly and accurately, as well as taste and smell the food and hear his family talking around him. Child D is confident that he would be able to accurately draw this scene from memory.

Regarding visual memory Child D improved in both short-term and long-term retention ability as indicated by his results on the Rey Complex Figure test. Here it was seen that Child D was able to improve his immediate recall image by 5.5 points and improve his delayed recall image by 4 points, improving his copy trial to be included in the 75th percentile on the age norms chart. Regarding memory in relation to performance on the specific sub-scales of the Kaufman Assessment Battery for Children that were used, Child D also showed an improvement in his memory abilities. This indicating that he responded favourably to the high imagery training received from the programme.

Intelligence Tests

Child D was assessed using the SSAIS-R intelligence test in the September of 2002. The results of this indicate that Child D has a Total IQ in the average range relative to the SSAIS-R norms. His Verbal Scale IQ is in the average range, and his Non-Verbal IQ is in the below average range.

Durell Analysis of Reading Difficulty (3rd Edition)

Child D improved on the Durell Analysis of Reading Difficulty test in all sub-scales administered. Regarding oral reading at the pre-test level he scored within a middle grade 2 level, however at the post test level it was found that Child D had increased by over a grade reading at a lower grade 4 level, with his comprehension being good at both testing stages. This improvement was also true for silent reading, where Child D improved from scoring a high grade 2 to scoring a lower grade 4. Regarding phonetic spelling a similar pattern was also observed with Child D initially scoring a middle grade 5 level at the pre-test but scoring a middle grade 6 range at post testing.

On the visual memory of words sub-scale, Child D improved from a mid grade 3 level to a mid grade 5 level indicating an increase in visual memory ability based on this test.

Scholastic Test Results

Child D's results may be summarised by the following table:

Table 4 - Summary of results

	Gained Scale Score	**Gained Raw Score**
Holborn Reading Scale	1 year 4 months	6
Schonell One Word Reading Scale	1 year 5 months	14
Schonell One Word Spelling Test	1year 4 months	13
Schonell Graded Dictation Test B	Positive score increase of 2	2
Schonell Graded Dictation Test C	Positive score increase of 6	6
Schonell Graded Dictation Test D	Positive score increase of 5	8

<u>Gained Scores:</u>

Child D has shown an improvement in all his tests. His reading as measured by both the Holborn and Schonell One Word Reading Scale has improved considerably with the results on both indicating an improvement of over a year. Regarding his spelling,

Child D has also improved considerably, as seen by his results on the Schonell One Word Spelling Test, which indicates an improvement of approximately 1 year and 4 months. Child D has also displayed encouraging improvement in his dictation results as seen by the three Graded Dictation tests of Schonell. On Test C of the Graded Dictation he made the most significant improvement, making 8 less errors in the post-test. Thus bringing his spelling age from that just below 7 years to just over 8 years (although the exact scores falling outside the norm tables and hence not being able to be calculated accurately).

As such it is possible to see that Child D has made encouraging improvements in both spelling (single words as well as dictation) and reading.

Phonic Inventories

Analysis of Child D's Phonic Inventories, at the beginning and at the end of the study, indicate that on Level 1 Child D made 9 fewer errors concerning ending blends and clusters, as well as fewer initial blends and clusters errors. The number of medial vowel errors, however increasing by 1. On Level 2 he made remarkable strides, illustrating an improvement regarding medial vowels and medial vowel digraphs, as well as ending blends and clusters. Child D made his greatest improvement on Level 3 though, which indicates an improvement with regards to suffixes and also fewer errors on ending blends and clusters in his post-test than in his pre-test. With these improvements however it was also noted that Child D made 2 more errors with his syllabification in his post-test and thus that this area remains one that is in need for further remediation and targeting.

Regular and Irregular Reading and Words and Non-words Reading tests

Analysis of Child D's Regular and Irregular Reading test indicates that of the 80 % of the regular words that he was able to get correct, 18 were classified as having a high frequency of occurrence and the other 14 had a low frequency of occurrence. Of the irregular words, Child D was able to correctly read 42.5% of all words, with 12 of these being of high frequency of occurrence and 5 having a low frequency. Analysis of his errors indicates difficulty with regards to medial vowels, as well as with ending blends and consonants. Regarding the Words and Non-words Reading test, Child D was able to read 75% of all 'Words' correctly, with 14 of these words being of high frequency of occurrence and 10 being low frequency words. Furthermore, Child D read 47% of all 'Non-words' correctly, of which 9 were high frequency and 6 were low frequency of occurrence. Again it was noted through the analysis of his errors that Child D has difficulty with medial vowels, vowel digraphs, as well as with ending blends and consonants.

Portfolio

Child D received remediation using the Targeted Revisualisation Programme for a period of six months between the pre-testing and post-testing stages. He was a quiet and somewhat reserved child who always worked well and would follow instructions to the letter. Furthermore, Child D was said to be incredibly polite and friendly once comfortable with his tutor. Child D took the lessons very seriously and constantly set high goals for himself – becoming visibly upset if he made too many mistakes. Child D clearly enjoyed the creative side of the programme as used particularly by Level four and liked working on the computer.

In the beginning of the study Child D would write stories and creative paragraphs consisting of very short sentences merely strung together. However, as his spelling showed improvement he gained the confidence to attempt longer, more descriptive sentences often coming up with amusing little tales and beaming with pride when praised by his tutor.

Child D thus responded well to the Targeted Revisualisation Programme. Most of the initial sessions centred on Levels one and two, with Level three only being used very briefly. With Child D's developing enthusiasm for creative writing though, a large majority of the later sessions were used to centre around a combination of Level two and Level four activities. This being done to provide variety and enhance Child D's enjoyment of what he was learning, in this way maintaining his attention throughout sessions and building up his remarkably low self esteem. Reading was also practised often during these later sessions, with Child D becoming absorbed in the book – particularly if the book was about ghosts and ghouls - and later writing possible endings for the story. It was noted during this time that Child D would break words up into appropriate sounds if he could not read it but when it came to spelling the word from sound would often have great difficulty. In this regard the programme proved successful as Child D showed a remarkable recall with words learnt using the Targeted Revisualisation Programme and was even able to extend these principle words to the correct spelling of some others improving his spelling ability in this manner.

4.1.5 Contrast group: analysis of Child E (Refer to Appendix Q)

Case History

Child E is a boy who was born on the 11th of February 1994, and who was ten years old throughout the duration of the study. He has two stepsiblings, an older stepsister and a younger stepbrother and lives together with his stepsiblings, his mother and his stepfather since their marriage when he was six years old.

Child E was apparently an unplanned baby and the pregnancy resulted in Child E's father leaving Child E's mother, relocating to Durban and denying any paternal connection to Child E. As a result Child E's mother was under a large amount of pressure and stress during her pregnancy. Child E's medical history shows that due to this stress complications arose necessitating the need to be delivered three weeks premature through an emergency caesarean. Despite this he enjoyed good health growing up and his development followed the average child's in all aspects except for speaking. With regards to speaking, Child E apparently was rather slow to develop and only chained words together after he had turned two years old.

Child E attended Nursery School as well as grade 1 at Northwest Christian school. Half way through grade 1 however, his teacher noted that he was falling behind in class and roughly assessed him as having attention difficulties. Child E fell behind his classmates and as a result was enrolled at Japari Remedial School from the beginning of his second grade. Child E has not been absent from school for any long period but still has difficulties with reading and constructing sentences (which he apparently hates doing). He is however making progress at Japari as he has settled

down nicely. Child E is happy at his current school and thoroughly enjoys maths as well as all sports.

Regarding his attitude towards school, Child E apparently does not mind school but is far more interested in the sports programme the school offers. Taking part in many extra murals including soccer, cricket, choir, and drama. With his achievements in maths and his enjoyment with working with numbers, his mother's only concern is his negative attitude towards spelling, reading and writing. She believes his problems to arise from this and also feels he has difficulty sounding words when he reads or writes. Child E has been attending occupational therapy since grade 1 and still attends this at Japari on a regular basis. In addition to this his mother is very supportive and spends large portions of the evening with him after work, helping him with his homework.

Child E has been reported as being popular and certainly has many friends. He has a good relationship with his teacher but apparently is not very close to his stepfamily at all. In fact it has been reported lately that Child E has expressed a longing to move to his biological father and away from his stepfather who he perceives to be overly strict and mean to him. Regarding his relationship with his step-siblings, Child E is said to have the normal sibling rivalry with his older sister and is apparently not very fond of his step-brother, whom he complains gets him into trouble and teases him about being in a remedial school.

Imagery Questionnaires and Memory

Child E reported only being able to see the mental image of a word very occasionally. Most often his mental image would be that of a picture representing the meaning of the word, however on the rare occasion that he would get an image of the actual word accompanying the picture, it would remain – sometimes only in part – until he was finished with it. This being true even if he said or spelt it. When seeing the word, the writing would be 'squiggly' and the background very distracting.

Regarding words in passages, Child E reports not being able to see any image of these words. In contrast though, when he has to write passages, Child E reports that if he is having difficulty he can close his eyes and sometimes get an image of the word. Whether this word is correctly spelt once written down however is difficult to distinguish for Child E as he says that it does not look very different from his mental image, which can become easily confused.

Regarding his mental imagery in general, as explored by the Galton's 'Breakfast-table' questionnaire, Child E is able to see relatively clear images provided that he really thinks. Reporting that by revisualising his breakfast experience he is able to see most things clearly but is not able to hear, smell or taste anything. Whilst being able to give a detailed account of what he could image, Child E needed a fair amount of prompting in order to answer this questionnaire.

Regarding visual memory Child E improved drastically in both short-term and long-term retention ability as indicated by his results on the Rey Complex Figure test. Here it was seen that Child E was able to improve his immediate recall image by 9

points and improve his delayed recall image by 12 points, still remaining in the 50th percentile on the age norms chart. This indicating that he has a vivid visual memory and it would be expected that he would respond favourably to the high imagery training such as that received from the Targeted Revisualisation programme.

Regarding memory in relation to performance on the specific sub-scales of the Kaufman Assessment Battery for Children that were used, Child E also showed an improvement in some areas of his memory abilities, however did not fare as well in all sub-scales tested. Thus it may be assumed that Child E has a better visual memory than his other forms of memory.

Intelligence Tests

Child E was assessed using the WISC-III intelligence test in the November of 2001. The results of this indicate that Child E has a Total IQ in the low average to below average range relative to the WISC-III norms. His Verbal Scale IQ is in the low to below average range, and his Non-Verbal IQ is in the low average to below average range.

Durell Analysis of Reading Difficulty (3rd Edition)

Child E's results varied on this test with him improving on some of the sub-scales of the Durell Analysis of Reading Difficulty administered and staying the same on others. Regarding oral reading at the pre-test level he scored within a middle grade 2 level, however at the post test level it was found that Child E was still reading at a middle grade 2 level, with his comprehension being good at both testing stages. This was also true for silent reading, where Child E improved only slightly from scoring a

middle grade 2 to a high grade 2. Regarding phonetic spelling, Child E initially scored a middle grade 4 level at the pre-test but scored a middle grade 5 range at post testing. On the visual memory of words sub-scale, Child E improved from a mid grade 2 level to a mid grade 3 level indicating an increase in visual memory ability based on this test.

Scholastic Test Results

Child E's results may be summarised by the following table:

Table 5 - Summary of results

	Gained Scale Score	**Gained Raw Score**
Holborn Reading Scale	6 months	2
Schonell One Word Reading Scale	6 months	5
Schonell One Word Spelling Test		-1
Schonell Graded Dictation Test B	Positive score increase of 11	11
Schonell Graded Dictation Test C	Positive score increase of /	12
Schonell Graded Dictation Test D	Positive score increase of /	8

<u>Gained Scores:</u>

Child E has shown an improvement in a large majority of his tests. His reading as measured by both the Holborn and Schonell One Word Reading Scale has improved slightly. With his improvement on reading single words and his sentence reading illustrating a satisfactory improvement of 6 months each.

Regarding his one word spelling, Child E has seemed to make no improvement, as seen by his results on the Schonell One Word Spelling Test. It should be noted though, that this was the last test to be administered and hence Child E was tired by this stage. Child E did on the other hand display an improvement in his dictation results as seen by the three Graded Dictation tests of Schonell. On Test C of the Graded Dictation he made the most improvement, making 12 less errors in the post-test. Bringing his spelling age from that well below seven years to seven years (although the exact scores falling outside the norm tables and hence not being able to be calculated accurately).

As such it is possible to see that Child E made improvements in both spelling (dictation) and reading, but that his one word spelling needs further remediation.

Phonic Inventories

An analysis of Child E's patterns of errors on the Phonic Inventories, comparing the pre- and post-test scores indicate that, on Level 1, he repeated the same patterns of errors in both administrations of the test except for ending blends and clusters where he made fewer errors in the post test than in the pre-test. On Level 2 Child E improved in all areas except for syllabification errors and vowel length confusions. In Level 3, Child E again – as on Level 1 - repeated the pattern of errors he had made in

the pre-test showing no improvements on Level 3 at a post test level. Hence illustrating that such areas are in need of remediation and targeting.

Regular and Irregular Reading and Words and Non-words Reading tests

Analysis of Child E's Regular and Irregular Reading test indicates that of the 80 % of the regular words that he was able to get correct, 19 were classified as having a high frequency of occurrence and the other 13 had a low frequency of occurrence. Of the irregular words, Child E was able to correctly read 77.5% of all words, with 20 of these being of high frequency of occurrence and 11 having a low frequency. Analysis of his errors indicates difficulty with regards to medial vowels, as well as with ending blends and consonants. Regarding the Words and Non-words Reading test, Child E was able to read 78% of all 'Words' correctly, with 15 of these words being of high frequency of occurrence and 10 being low frequency words. However, Child E was unable to read any of the 'Non-words' correctly, getting all 32 incorrect regardless of whether they were high frequency or low frequency of occurrence. Again it was noted through the analysis of his errors that Child E has difficulty with medial vowels, vowel digraphs, as well as with ending blends and consonants.

Portfolio

Child E received six months of traditional remediation. He was said to be less than eager to attend lessons but would never the less aim to please his tutor. Constantly he would become easily distracted and more often than not his tutor would have to come up with creative means to maintain even the slightest bit of his attention during the session. An example of this being making Child E write his words on the board or

cleverly disguising word families in games. Child E worked hard when able to but was noted as being very talkative towards the end of the study.

His writing at the beginning of the study was described by his tutor as being poor, with short – non-linking - sentences merely placed in a paragraph instead of written on separate lines. This paragraph often-lacking punctuation. Towards the end of the study Child E would attempt to use descriptive language in these passages – which were supposedly better punctuated and flowing - but would need a lot of encouragement to do so.

Child E's tutor felt that he was making progress but only very slowly, often having to go over words that were dealt with in the previous lesson, which Child E could not recall doing at all. These lessons generally followed the same pattern and covered a recap of work previously done, reading, word games, as well as detailed and colourful spelling worksheets and extensive word families.

4.1.6 Contrast group: analysis of Child F (Refer to Appendix R)

Case History

Child F is a boy who was born on the 27th of August 1994, and who is ten years old. He is the only son of a family of four children and lives with both parents who are still married. According to his family he is a happy child and receives a large amount of support from all members of the family.

Child F's medical history illustrated that he suffered no unusual birthing conditions. Throughout his early childhood, Child F showed early development reaching certain milestones prematurely with only the usual childhood illnesses (chicken pox and measles) but otherwise displaying generally good health.

Child F attended school at Sacred Heart College until the end of his grade 0 year and was referred to Japari from grade 1 because it was felt that staying in mainstream schooling would eventually mean failing. He was however, referred to a Neurologist who diagnosed him as being attention deficit disordered. At this school Child F is said to be making progress but apparently does not take school overly seriously.

His areas of difficulty being with learning subjects, aspects of maths, reading as well as spelling. According to Child F's mother, these difficulties arising from his difficulty concentrating and his apparent boredom at school. Presently Child F is receiving additional help from the school and attends occupational therapy and speech therapy on a weekly basis. His strengths - on the other hand - including drama as well as all sporting activities. Child F takes part in numerous sporting activities at the school (soccer, cricket and athletics) and is also a member of a soccer club and does gymnastics, doing well in whatever sport he tries, but particularly enjoying swimming and roller-skating.

Through all his sporting activities, Child F has made many friends and is a popular boy at school. He has maintained a best friendship though since grade 1 and enjoys spending time with him and all his other friends. He has a good relationship with his current teacher, and despite the normal sibling rivalry, has a good relationship with

his siblings even though there is a significant age gap between himself and his two older sisters (one of whom is 22 and the other who is 27 years old). Child F appears to be compared to his younger sister a lot by his parents, and often bickers with her.

Imagery Questionnaires and Memory

Child F reports being able to see an image of the word but with a large amount of effort and difficulty. He reports that the majority of the time he gets an image of a picture depicting the word and it is only if he then concentrates harder that he may be able to go beyond this image and see the word and the picture. The letters of the word seen by Child F may be in either cursive or print depending on the medium that he is using at the time and reportedly are in black. Colour names however, are almost always written in the colour they denote. Child F is unable to maintain this image after he has said it or spelt at which point the image (of both the word and picture) begins to fade.

Child F does not see the image of the word or its picture when working with passages. When it comes to writing, if Child F does not merely recall the spelling of a word he is able to spell it from sound. When doing so - if the word is one that he has seen before - he can tell if it is spelt correctly at this stage because he reports that it just 'looks different'. However if he does not know the word he cannot tell whether it is correct or not as he does not know the difference.

Regarding his mental imagery in general, as explored by the Galton's 'Breakfast-table' questionnaire, Child F is able to see hazy images that are mostly in black and white and soft colours. Reporting that by revisualising his breakfast experience he is

able to see most things on the table but not the people having breakfast with him. Furthermore, although he is not able to hear, smell or taste anything he can guess at these things from memory but this reportedly cannot be accessed while the image is in his mind.

Regarding visual memory Child F showed very little to no improvement in both short-term and long-term retention ability as indicated by his results on the Rey Complex Figure test. Here it was seen that Child F appears to have poor fine visuo-motor co-ordination, with his copy trial drawn inaccurately in both pre and post test situations and his scores remaining well below the 25th percentile on the age norms chart. Furthermore, it should be noted that Child F disliked the test very intensely scoring it as zero out of ten without prompting and being very hard on himself. Regarding memory in relation to performance on the specific sub-scales of the Kaufman Assessment Battery for Children that were used, Child F also did not fare too well, displaying varied results in all sub-scales tested.

Intelligence Tests

Child F was assessed using the SSAIS-R intelligence test in the July of 2002. The results of this indicate that Child F has a Total IQ in the low average to below average range relative to the SSAIS-R norms. His Verbal Scale IQ is in the average range, and his Non-Verbal IQ is in the low average to below average range.

Durell Analysis of Reading Difficulty (3rd Edition)

Child F's results varied on this test with him improving on some of the sub-scales of the Durell Analysis of Reading Difficulty administered and staying the same on

others. Regarding oral reading at the pre-test level he scored within a middle grade 4 level, however at the post test level it was found that Child F was still reading at a middle grade 4 level, with his comprehension improving from fair to good between testing stages. Regarding silent reading, Child F performed better on the pre-test scoring a high grade 4, however he only scored a middle grade 4 during post testing. This pattern was true for phonetic spelling as well with Child F initially scoring a middle grade 5 level at the pre-test but a middle grade 4 range at post testing. On the visual memory of words sub-scale, Child F remained constant scoring a mid grade 4 level in visual memory ability based on this test.

Scholastic Test Results

Child F's results may be summarised by the following table:

Table 6 - Summary of results

	Gained Scale Score	**Gained Raw Score**
Holborn Reading Scale		-1
Schonell One Word Reading Scale	Stayed the same	Stayed the same
Schonell One Word Spelling Test	7 months	6
Schonell Graded Dictation Test B	Positive score increase of 1	1
Schonell Graded Dictation Test C	Positive score increase of 4	4
Schonell Graded Dictation Test D	Positive score increase of 6	8

Gained Scores:

Child F has shown an improvement in almost all of his tests. His reading, as measured by the Holborn Scale and the Schonell One Word Reading Scale indicate that Child F has remained similar at both pre and post test levels. With his one word reading age being higher than his sentence reading indicating that Child F does not rely on context to read. Regarding his spelling, Child F has improved, as seen by his results on the Schonell One Word Spelling Test, which indicates an improvement of approximately 7 months. Child F has also displayed an improvement in his dictation results as seen by the three Graded Dictation tests of Schonell administered. On Test D of the Graded Dictation, Child F made a significant improvement, making eight less errors in the post-test. Thus bringing his spelling age from that just below eight

years to just under nine years (although the exact scores falling outside the norm tables and hence not being able to be calculated accurately).

As such it is possible to see that Child F made improvements in spelling (single words as well as dictation) but remained the same in reading.

The Phonic Inventories

An analysis of Child F's Phonic Inventories, comparing pre- and post-test scores, indicates that on Level 1 he made fewer errors regarding ending blends and clusters. It is also noted however, that the amount of errors on initial blends as well as on medial vowels, although being low, remained the same for both tests. On Level 2 an improvement was again noticed on ending blends and clusters and on this level it was seen that the number of errors on medial vowels as well as on medial vowel digraphs decreased encouragingly. With no medial vowel errors being made for the post test on Level 3 it could again be seen that Child F improved in this regard and that his ending blends and clusters as well as his suffix errors improved in the post-test. Child F also made less errors with syllabification in his post-test than he did in his pre-test.

Regular and Irregular Reading and Words and Non-words Reading tests

Analysis of Child F's Regular and Irregular Reading test indicates that of the 90 % of the regular words that he was able to get correct, 19 were classified as having a high frequency of occurrence and the other 17 had a low frequency of occurrence. Of the irregular words, Child F was able to correctly read 82.5% of all words, with 20 of these being of high frequency of occurrence and 13 having a low frequency. Analysis of his errors indicates difficulty with regards to medial vowels, as well as with ending

blends and consonants. Regarding the Words and Non-words Reading test, Child F was able to read 87.5% of all 'Words' correctly, with 16 of these words being of high frequency of occurrence and 12 being low frequency words. Furthermore, Child F read 53% of all 'Non-words' correctly, of which 8 were high frequency and 9 were low frequency of occurrence. Again it was noted through the analysis of his errors that Child F has difficulty with medial vowels, vowel digraphs, as well as with ending blends and consonants.

Portfolio

Child F received six months of traditional remediation. He was said to be very excitable and rarely co-operative and would try to get out of doing his work as often as possible. When finding that he had to do work however, Child F would work hard but very fast – this often at the expense of his mastery of tasks.

Child F's writing at both the beginning and near the end of the study was described by his tutor as lacking creativity and coherence. It was noted however, that Child F would attempt to use more descriptive words in his passages towards the end of the study and provided he was supported by his tutor and writing about more factual events would produce acceptable paragraphs. Child F's tutor noted that despite his protests regarding doing extra work, he would seem to enjoy the sessions. These sessions generally following the same pattern and covered reading, spelling worksheets and word families.

4.1.7 Contrast group: analysis of Child G (Refer to Appendix S)

Case History

Child G is a boy who was born on the 2nd of December 1992, and turned twelve years old after post-testing was completed. He is an only child and lives with both his parents who report being happily married and who seem supportive.

Child G's medical history illustrates that birthing conditions were not optimal. His mother is reportedly diabetic and apparently became toxaemic thus resulting in the necessity to induce labour and deliver Child G through emergency caesarean. Following this rather traumatic entrance into the world, Child G illustrated a complicated medical history – including being in the neonatal intensive care unit for five weeks after birth to receive phototherapy for his severe jaundice, a dextrose drip to improve his insulin shock and later to just remain on an anti-biotic drip. By this fifth week on anti-biotic medication it was discovered that Child G had severe liver damage thus resulting in Child G being hospitalised for the entire first six months of his life. The following five years of Child G's life were punctuated with numerous hospitalisations and finally when Child G was six years old he received a liver transplant but was placed on anti-rejection medication that affected his behaviour significantly. Thus, with all his medical complications and hospitalisations, Child G was not able to follow a normal development, hence reaching milestones at older ages and then generally being inattentive because of his anti-rejection medication.

Once recovered from his transplant, Child G returned to school at Someveld in Brakpan where he repeated the year, but was said to make no progress. Child G

began to demonstrate difficulties with reading and most other academic areas, eventually being enrolled at Japari Remedial School from grade 2 where he is now progressing slowly but steadily. His strengths being in drama and most non-academic areas.

Child G has a positive attitude towards school and tries very hard to do well in all aspects there of – being extremely hard on himself when he perceives to have failed. According to his mother, Child G appears to have a problem with phonics and that the majority of his other scholastic difficulties (which are predominantly of a reading and spelling nature) are as a result. These problems having been attempted to remediate through additional reading therapy as well as paired reading during school.

Child G has only few friends but is generally well liked. He has one particular friend whom he has been very close to since his enrolment at Japari. Furthermore, Child G has a good relationship with his teacher and is said to be respectful and well disciplined. According to his parents, Child G is given his 'own space' at home and encouraged to do the things that interest him for example play on the PC or on playstation and listen to music. He has a close and open relationship with his immediate as well as extended family, all of whom are said to be very protective over Child G.

Imagery Questionnaires and Memory

Child G reported that he could see an image of a word in his mind but that try as he might this image was always rather hazy and often not very clear. The image always appeared on a white, lined piece of paper in his handwriting (which even in his mind

was terribly untidy and difficult to read) and was reported to be small. The word was usually in the same colour as his pen that he was busy with but as he most often wrote in blue ink or pencil the colour was most often blue or grey. Child G stated that having said the word or spelt it out loud, the image would disappear rather quickly, fading and becoming smaller until it was no longer visible and only being able to regain the image (in exactly the same form) if he concentrated very hard – which he hated to have to do as it gave him a headache.

Regarding words in a passage, Child G reports being able to see an image of the words as they follow in succession but not doing this often as he finds it too tiring. In the rare instances when he does image the words, they are in black print and are equally as hazy and unclear, with the image becoming more and more hazy the longer he works and the more tired he becomes.

When it comes to writing down words from their image, Child G reports that the image does not remain long enough for him to complete the word and thus often when writing, the word just comes out. But if he cannot spell it he tries sounding the word out and if he gets it correct it usually 'looks right' and can tell the difference between incorrect and correct words because if a word does not match his image it then 'feels wrong'. When the word is spelt incorrectly in his image, Child G is unable to see the difference.

Regarding his mental imagery in general, as explored by the Galton's 'Breakfast-table' questionnaire, Child G is able to see relatively clear images. Reporting that by revisualising his breakfast experience he is able to see most things clearly but is only

very rarely able to hear, smell or taste anything. Child G reports that in order to see this and experience it, he has to really think and also needed a fair amount of prompting in order to answer this questionnaire.

Regarding visual memory Child G showed very little to no improvement in both short-term and long-term retention ability as indicated by his results on the Rey Complex Figure test. Here it was seen that Child G improved by 1.5 points in the immediate recall image but was 4 points higher on the delayed recall drawing in the pre-test than his post test drawing. His scores remaining below the 25th percentile on the age norms chart. Furthermore, it should be noted that Child G disliked the test very intensely, becoming very conscious of his shaking (a condition from the liver transplant) and being very hard on himself. Regarding memory in relation to performance on the specific sub-scales of the Kaufman Assessment Battery for Children that were used, Child G showed an improvement in some areas of his memory abilities, however did not fare as well in all sub-scales tested.

Intelligence Tests

Child G was assessed using the WISC-III intelligence test in the October of 2003. The results of this indicate that Child G has a Total IQ in the average range relative to the WISC-III norms. His Verbal Scale IQ is in the average range, and his Non-Verbal IQ is in the average range.

Durell Analysis of Reading Difficulty (3rd Edition)

Child G's results varied on this test with him improving on some of the sub-scales of the Durell Analysis of Reading Difficulty administered and staying the same on

others. Regarding oral reading at the pre-test level he scored within a low grade 2 level, however at the post test level it was found that Child G was still reading at a low grade 2 level, with his comprehension being good at both testing stages. This was also true for silent reading, where Child G remained the same scoring a low grade 2 at both testing sessions. Regarding phonetic spelling, Child G initially scored outside the norm area at the pre-test but scored a middle grade 4 at post testing. On the visual memory of words sub-scale, Child G improved from a mid grade 1 level to a mid grade 2 level indicating an increase in visual memory ability based on this test.

Scholastic Test Results

Child G's results may be summarised by the following table:

Table 7 - Summary of results

	Gained Scale Score	**Gained Raw Score**
Holborn Reading Scale	8 months	3
Schonell One Word Reading Scale	5 months	5
Schonell One Word Spelling Test		-9
Schonell Graded Dictation Test B	Positive score increase of 7	8
Schonell Graded Dictation Test C		-1
Schonell Graded Dictation Test D		-3

Gained Scores:

Child G has shown a variation in his tests results, with some indicating that he has made no significant change, whilst others indicate that he has made some improvement. His reading, as measured by the Holborn Reading Scale, illustrates an improvement of approximately eight months. It was noted though that Child G relies on context to read. Thus it is not surprisingly then that he performed better on the sentence reading of the Holborn than he did on the Schonell One Word Reading Scale, where he showed an improvement of five months. Regarding his spelling, Child G illustrated no improvement as seen by his results on the Schonell One Word Spelling Test, which indicates an increase in errors at the post test stage. Child G however, displayed a very little improvement in his dictation results as seen by the first of the three Graded Dictation tests of Schonell that were administered. On Test B of the Graded Dictation he made eight less errors in the post-test. Despite his efforts on the other forms of this test, his total amount of errors in Test C and D exceeding that of 25 and his score thus not being able to be attained, with it being believed that these levels were too advanced for him.

As such it is possible to see that Child G has made improvements in both single word reading as well as sentence reading, but that his one word spelling and his dictation need to be targeted further in order for him to improve in these areas.

Phonic Inventories

An analysis of Child G's patterns of errors on the Phonic Inventories, comparing the pre- and post-test scores indicate that, on Level 1, he repeated a similar pattern of

errors in both administrations of the test. Having a high level of difficulty with ending blends and clusters and making several errors with sound confusions in both tests. Regarding medial vowels, however, Child G made 5 fewer errors in the post test indicating an improvement in this regard. On Level 2 this repetition of the error pattern being evident once again. However in this instance showing an increase in errors with medial vowel digraphs and a slight increase in errors with syllabification. In Level 3 the pattern of errors continued to be repeated. Child G did however appear to improve with regards to medial vowels making fewer errors during the post test. Despite this improvement though, Child G has made more sound confusion errors. Hence illustrating that Child G has many areas that are in need of remediation and targeting.

Regular and Irregular Reading and Words and Non-words Reading tests

Analysis of Child G's Regular and Irregular Reading test indicates that of the 75 % of the regular words that he was able to get correct, 17 were classified as having a high frequency of occurrence and the other 13 had a low frequency of occurrence. Of the irregular words, Child G was able to correctly read 45% of all words, with 10 of these being of high frequency of occurrence and 8 having a low frequency. Analysis of his errors indicates difficulty with regards to medial vowels, as well as with ending blends and consonants. Regarding the Words and Non-words Reading test, Child G was able to read 65.6% of all 'Words' correctly, with 12 of these words being of high frequency of occurrence and 9 being low frequency words. Furthermore, Child G read 56% of all 'Non-words' correctly, of which 12 were high frequency and 6 were low frequency of occurrence. Again it was noted through the analysis of his errors

that Child G has difficulty with medial vowels, vowel digraphs, as well as with ending blends and consonants.

Portfolio

Child G received six months of traditional remediation. He was said to be co-operative throughout this time and would diligently carry out tasks required of him, occasionally becoming easily distracted or talkative and more often than not appearing tired throughout the session. Child G worked hard and became frustrated with himself when he made errors. It was noted that he was incredibly hard on himself, becoming verbally abusive towards himself if he felt his handwriting was too untidy or that he should be performing better at the task.

His writing at both the beginning and near the end of the study was described by his tutor as being creative but lacking punctuation and sometimes, as a result, coherence. He would attempt to use descriptive language in these passages but would limit this to the words he was confident in spelling. It was noted though that Child G's paragraphs were generally of a much better standard when they were about Play Station games, which are Child G's love in life.

Trying to keep the 'Play Station game' theme throughout the sessions, Child G's tutor noted that he seemed to enjoy the sessions, at one stage reporting that he looked forward to their meetings. These meetings generally following the same pattern and covered reading, word games, as well as spelling worksheets and word families.

4.1.8 Contrast group: analysis of Child H (Refer to Appendix T)

Case History

Child H is a girl who was born on the 4th of November 1994, and who is ten years old. She is the middle child in a family of three children and has two brothers. Her parents are married and apparently have high expectations of their daughter.

According to Child H's medical history, she was born by caesarean but there were no complications. Throughout her childhood Child H experienced good health with only the occasional colds and flu and appeared to have a normal development, reaching milestones at appropriate ages.

Child H attended school at the Holy Rosary school until the end of grade 2, and is said to have been doing relatively well until her reading began to slip in the beginning of grade 2 and escalated to her slow progress with school work. Child H's difficulties were first noted by her grade 2 teacher who saw that Child H was slow working and had difficulty reading. Following a full psychological assessment Child H was then diagnosed as having attention deficit disorder and was placed on Ritalin. She was later enrolled at Japari Remedial School from grade 3 and has since been making slow but steady progress. Child H's difficulties are predominantly related to reading and comprehension but she is reported to be strong in maths, science, as well as music.

Child H enjoys going to school but does not take part in any of the extra murals offered, choosing instead to do baseball through an outside club and excelling therein. Currently at school Child H is having difficulty concentrating but besides the smaller

classes at Japari that allow the teacher to provide more attention to each child, Child H is receiving no additional help.

Child H enjoys the company of many friends and has one best friend whom she enjoys spending time with. Her relationship with her current teacher, however, is not that strong as Child H has difficulty understanding her most of the time. Similarly, Child H does not have a very good relationship with either of her brothers and there is constant bickering at home as a result. According to her mother though, Child H has a good open relationship with her parents who are very proud of her particularly with regards to her achievements in baseball.

Imagery Questionnaires and Memory

Child H reported only being able to see the mental image of a word very occasionally. Most often her mental image would be that of a picture representing the meaning of the word, however on the rare occasion that she would get an image of the actual word accompanying the picture, it would remain clear until she was finished saying or spelling it. Most often the word was written in purple and yellow and was 'squiggly'.

Regarding words in passages, Child H reports not being able to see any image of these words because she does not have enough time before she needs to have the next word ready. In contrast though, when she has to write passages, Child H reports that if she is having difficulty she can close her eyes and sometimes get an image of the word – provided she is not hurried like in testing situations. Whether this word is correctly spelt once written down however is difficult to distinguish for Child H if it is a new

word, as she says that it does not look very different from her mental image. Provided her mental image is correct though, Child H is confident that she would be able to see whether she has spelt a word correctly or not.

Regarding her mental imagery in general, as explored by the Galton's 'Breakfast-table' questionnaire, Child H is able to see vivid images. Reporting that by revisualising her breakfast experience she is able to see everything clearly and accurately, as well as taste and smell the food and hear her family talking around her.

Regarding visual memory Child H showed very little to no improvement in both short-term and long-term retention ability as indicated by her results on the Rey Complex Figure test. Here it was seen that Child H appears to have poor fine visuo-motor co-ordination, with her copy trial drawn unrecognisably in the pre-test and inaccurately in the post test situation and her subsequent drawings being affected by these poor initial drawings. Regarding memory in relation to performance on the specific sub-scales of the Kaufman Assessment Battery for Children that were used, Child H showed small improvements in some areas of her memory abilities, however did not fare as well in all sub-scales tested.

Intelligence Tests

Child H was assessed using the SSAIS-R intelligence test in the December of 2003. The results of this indicate that Child H has a Total IQ in the average range relative to the SSAIS-R norms. Her Verbal Scale IQ is in the high average range, and her Non-Verbal IQ is in the average range.

Durell Analysis of Reading Difficulty (3rd Edition)

Child H's results varied on this test with her improving on some of the sub-scales of the Durell Analysis of Reading Difficulty administered and staying the same on others. Regarding oral reading at the pre-test level she scored within a high grade 2 level, however at the post test level it was found that Child H was reading at a middle grade 3 level, with her comprehension being good at both testing stages. This improvement was also true for silent reading, where Child H improved from scoring a low grade 3 to a high grade 3. Regarding phonetic spelling however, Child H fell outside the norm areas on both occasions. On the visual memory of words sub-scale, Child H remained the same, scoring a mid grade 2 visual memory ability based on this test.

Scholastic Test Results

Child H's results may be summarised by the following table:

Table 8 - Summary of results

	Gained Scale Score	**Gained Raw Score**
Holborn Reading Scale	8 months	3
Schonell One Word Reading Scale		-2
Schonell One Word Spelling Test	8 months	6
Schonell Graded Dictation Test B	Positive score increase of 7	7
Schonell Graded Dictation Test C	Positive score increase of 2	2
Schonell Graded Dictation Test D	Positive score increase of /	3

Gained Scores:

Child H has shown an improvement in all except one of her tests. Her reading as measured by the Holborn Reading Scale has improved considerably. It is however noticeable that Child H relies on context to read and that thus her improvement on reading single words remained virtually the same whilst her sentence reading – which allows her access to contexts – improved by eight months.

Regarding her spelling, Child H has seemed to make a small improvement in both spelling singular words and in dictation, as seen by her results on the Schonell One Word Spelling Test and the Graded Dictations. On the Schonell One Word Spelling test Child H improved by eight months and on Test B of the Graded Dictation she

made the most improvement, making seven less errors in the post-test. Her spelling age however still remaining below seven years (although the exact scores falling outside the norm tables and hence not being able to be calculated accurately).

As such it is possible to see that Child H made improvements in both spelling and sentence reading, but that her one word reading needs further remediation.

Phonic Inventories

An analysis of Child H's Phonic Inventories, comparing her results on the pre- and post-tests, indicates that on Level 1 she made some improvement on ending blends and clusters as well as on initial blends. This improvement being only minimal however. On Level 2 this difference was not observed, but it was clear that in both the pre- and post-tests Child H had repeated her pattern of errors, thus making a very similar amount and type of errors, improving only slightly in medial vowels as well as medial vowel digraphs. On Level 3 Child H made the most improvement. Here it was noted that she made no errors regarding initial consonants, initial blends and medial vowels at all on the post test. Her ending blends and clusters as well as her syllabification errors also displayed an improvement. Despite these improvements however, Child H made more errors regarding sound confusion at the post test level, thus indicating that this remains an area that will need to be targeted further.

Regular and Irregular Reading and Words and Non-words Reading tests

Analysis of Child H's Regular and Irregular Reading test indicates that of the 72.5 % of the regular words that she was able to get correct, 20 were classified as having a high frequency of occurrence and the other 9 had a low frequency of occurrence. Of

the irregular words, Child H was able to correctly read 60% of all words, with 20 of these being of high frequency of occurrence and 4 having a low frequency. Analysis of her errors indicates difficulty with regards to medial vowels, as well as with ending blends and consonants. Regarding the Words and Non-words Reading test, Child H was able to read 68.8% of all 'Words' correctly, with 15 of these words being of high frequency of occurrence and 7 being low frequency words. Furthermore, Child H read 40.6% of all 'Non-words' correctly, of which 7 were high frequency and 6 were low frequency of occurrence. Again it was noted through the analysis of her errors that Child H has difficulty with medial vowels, vowel digraphs, as well as with ending blends and consonants.

Portfolio

Child H received six months of traditional remediation. She was said to be co-operative throughout this time and would diligently carry out tasks required of her. Child H worked hard and according to her parents is said to have flourished under her tutor's praise and positive attitude.

Child H's writing at both the beginning and near the end of the study was described by her tutor as being creative. It was noted however, that Child H would attempt to use the words she was confident in spelling thus often talking in circles at the expense of coherence and flow. In order to expand Child H's spelling vocabulary and increase her academic risk taking, Child H's tutor developed puzzles with word families and used these in lessons. Child H's tutor noted that she seemed to enjoy the sessions. These meetings generally following the same pattern and covered reading, word games, as well as spelling worksheets and word families.

4.2 Aggregation of Case Studies

After analysing the data from each case study separately, the data from the four children in the experimental group and the four children in the contrast group were clustered and aggregated. The aggregation of results was done on two levels ~

1. By grouping the individual case study results into experimental and contrast clusters for comparative purposes, and then by
2. Examining all eight case studies as a total group in order to draw out similar patterns and trends.

Before continuing with the analysis any further, it should be reiterated that it was not the intention of this research to draw causal relationships or to run statistical analyses. Instead the purpose of this analysis was purely descriptive and attempted to draw out patterns and trends.

It is the intention that the results of this research are interpreted in conjunction with previously conducted studies on the programme (Abelheim, 2002; Booth, 2003; Els, 2003; George, 2002; MacReadie, 2001; Picton, 2002; Ravenscroft, 2002; Sampson, 2002; Sfetsios, 2002; Wilson, 2001). In line with these previous studies all the children who were selected for the current study had severe learning difficulties in the areas of reading, writing and spelling which were resistant to treatment. This diagnosis was based on the fact that they had been found to have been unresponsive to the previous forms of remediation they had each received. The children in the sample

were also all on the same level at school and had thus been matched according to their scores on the intelligence tests in order to facilitate this comparison.

4.2.1 Aggregation of case studies into separate experimental group and contrast group clusters

It was noted from the discussion on visual memory abilities particularly with regard to the Rey Complex Figure that those children trained to use high imagery techniques as with the Targeted Revisualisation programme performed better on the post test drawings indicating improved short and long tem memory. Those children in the contrast group, however, did not perform as well, thus indicating that the training of imagery techniques specific to the experimental group produced an improvement in visual memory retention and recall. A similar pattern was also found to be true based on the Kaufman Assessment Battery for Children, as well as the visual memory of words sub-test of the Durell Analysis of Reading Difficulty (3rd edition).

Furthermore, results on the Durell Analysis of Reading Difficulties (3rd edition) indicated that those children in the experimental group improved in all sub-tests administered. Whilst those in the contrast group did not fare as favourably, with some only illustrating minor improvements in one of the sub-tests but remaining the same in all others.

Regarding performance on the scholastic tests –

Table 9 – Aggregation of scholastic test results: Experimental group

Experimental Group	Holborn Reading Scale	Schonell Reading Scale	Schonell Spelling Test	Schonell Graded Dictation B	Schonell Graded Dictation C	Schonell Graded Dictation D
Child A	3	-6	-1	5	2	4
Child B	7	4	5	-2	0	2
Child C	5	-4	5	5	4	2
Child D	6	14	13	2	6	8
Total Gain	21	8	22	10	12	16
Average Performance Gain	5.25	2	5.5	2.5	3	4

Table 10 – Aggregation of scholastic test results: Contrast group

Contrast Group	Holborn Reading Scale	Schonell Reading Scale	Schonell Spelling Test	Schonell Graded Dictation B	Schonell Graded Dictation C	Schonell Graded Dictation D
Child E	2	5	-1	11	12	8
Child F	-1	0	6	1	4	8
Child G	3	5	-9	8	-1	-3
Child H	3	-2	6	7	2	3
Total Gain	7	8	2	27	17	16
Average Performance Gain	1.75	2	0.5	6.75	4.25	4

Clustering of results of the experimental and contrast group suggested that those children receiving remediation following the Targeted Revisualisation Programme made greater improvement in all areas except one. It was noted that those receiving traditional remediation made a greater improvement on the graded dictation tests – particularly on Test B.

The greatest improvements made by those in the experimental group relating to the Holborn Reading Scale as well as Schonell One Word Spelling Scale. This compared with the fact that the contrast group only made an average gain of 1.75 on the Holborn reading test and 0.5 on the Schonell One Word Spelling test. Overall, the results of

this study suggest that the Targeted Revisualisation Programme produced greater advantage in reading and spelling as a form of remediation for grade 4 children with learning disabilities than traditional remediation techniques. The results for paragraph spelling were not as favourable. The former findings were similar to those of previous studies involving use of the programme (Abelheim, 2002; Booth, 2003; Els, 2003; George, 2002; MacReadie, 2001; Picton, 2002; Ravenscroft, 2002; Sampson, 2002; Sfetsios, 2002; Wilson, 2001), while the latter finding was in contrast to the majority of previous studies, which have also shown that paragraph dictation had increased greatly in children exposed to the programme (Abelheim, 2002; Booth, 2003; Els, 2003; George, 2002; MacReadie, 2001; Picton, 2002; Ravenscroft, 2002; Sampson, 2002; Sfetsios, 2002; Wilson, 2001).

As such, when viewed in conjunction with the results of previous studies conducted on the programme, it may be hypothesised that the techniques used by the programme – such as word analysis, visualisation and revisualisation – are able to increase the child's understanding of the structure of the English language. They appear to have considerable benefit in developing the decoding skills involved in reading and the successive processing and integrative skills involved in dictation. As such the effects of the Targeted Revisualisation Programme would appear to be encouraging and favourable.

4.2.2 Aggregation of case studies into a single cluster: indications concerning mental imagery and memory

The eight individual case studies aggregated into one cluster suggested several trends apparent in the sample. Besides all having difficulties in the areas of reading, writing and spelling, and showing little responsiveness to other forms of remediation to this point, all showed improvement in at least one area following their involvement in the study. It was also found that all the children reported using mental imagery – to a greater or lesser degree - as a learning strategy for learning or remembering words. Thus illustrating the need for further research into this area and the potential that the development of such skills has in aiding children with learning disabilities.

Another trend that was spotted was that, with encouragement, all the children were able to improve their writing, becoming more descriptive with their gaining confidence. It was also noted through the analysis of each child's performance on the Phonic Inventories, that most of the children had a large amount of difficulty regarding ending blends and clusters, most times these errors accounting for the majority of their error pattern. This finding lending itself to the possibility of researching the common patterns of errors as illustrated by children with learning disabilities, and as seen on the Phonic Inventories. Through the analysis of each child's Regular and Irregular Words Reading test and the Words and Non-word Reading test it was further found that all the children experienced difficulty regarding medial vowels and ending blends and clusters, with errors of this nature forming the majority of errors made in phonetic reading.

4.3 Findings as they relate to the Research Questions

Question One: Is there a link between mental imagery and memory?

The first question that this study dealt with was whether there is a relationship between mental imagery and memory. It was noted from the discussion on visual memory abilities particularly with regard to the Rey Complex Figure that those children trained to use high imagery techniques as with the Targeted Revisualisation programme performed better on the post test drawings indicating improved short and long tem memory. Those children in the contrast group, however, did not perform as well, thus indicating that the training of imagery techniques specific to the experimental group produced an improvement in visual memory retention and recall. A similar pattern was also found to be true based on the Kaufman Assessment Battery for Children, as well as the memory of words sub-test of the Durell Analysis of Reading Difficulty (3rd edition). Thus it may be noted that there does indeed appear to be a rather strong relationship between imagery and memory, with those children reporting experiencing vivid and detailed images, performing better on memory recall tasks than those with weaker mental imaging capabilities.

Question Two: Do children with learning disabilities use mental imagery as a learning aid for learning words?

The second question that this study dealt with was the investigation as to whether or not children with learning disabilities use mental imagery as an aid for learning words. From the aggregation of the case studies into a single cluster it was found that children with learning disabilities do make use of mental imagery to learn or remember words. Differences were noted only in the clarity of the image and its form as well as how frequently such imagery was used. The children in the experimental group, who received training using the Targeted Revisualisation Programme, were noted to use these techniques more frequently and with better results. However,

despite not receiving training in this regard, the children in the contrast group also reported using different forms of imagery to help them learn and remember words.

It appears from these findings then, that grade 4 children with learning disabilities do use mental imagery as a learning aid. The fact that this phenomenon was found in the self-reported learning strategies of all children in the study would suggest that mental imagery could fruitfully be used as the basis for learning. The findings of this study when viewed in conjunction with previous studies on the Targeted Revisualisation Programme, would also suggest the value of the type of high imagery teaching techniques introduced in the programme, particularly in working with children with learning difficulties who have not made progress using other forms of remediation.

Question Three: Is the Targeted Revisualisation Programme effective in improving the reading abilities of children with learning disabilities?

The third question related to the effectiveness of the Targeted Revisualisation Programme in improving the reading abilities of children with learning disabilities. The results of the study indicate that the programme had a positive effect on the ability of the children who received this method of remediation. The children in the contrast group who received traditional remediation also made improvements. However it was noted that the gains made by those on the Targeted Revisualisation Programme were greater regarding both sentence reading as well as one word reading abilities and regarding silent reading as well as oral reading. On the basis of this evidence, it may thus be concluded that the Targeted Revisualisation Programme is effective as a tool for the remediation of reading abilities of grade 4 children with learning disabilities.

Question Four: Is the Targeted Revisualisation Programme effective in improving the writing abilities of children with learning disabilities?

This question aimed at exploring the effectiveness of the Targeted Revisualisation Programme on improving the writing abilities of children with learning disabilities. As illustrated by the gains on the Schonell Graded Dictation Tests – which measure contextual and integrative spelling as well as writing abilities – and the subjective accounts of each child's tutor, it was found that those children in the experimental group made similar gains to those in the contrast group, except for Test B, where the contrast group made more gains than those in the experimental group. Based on the tutor's accounts it was seen that all the children became more descriptive and would write longer sentences when give writing tasks. It was also noted through an analysis of their creative writing that the children used punctuation slightly better at the end of the study and would have a more logical and clearer flow to their stories. Whilst both groups were said to improve in their paragraph and story writing, it was the children who received the Traditional remedial techniques that indicated an improvement across all three tests of the Graded Dictation. It appears from these results that the Targeted Revisualisation Programme is an effective means for improving the writing abilities of grade 4 children with learning disabilities but that the usefulness of Traditional techniques in this regard should not be discarded.

Question Five: Is the Targeted Revisualisation Programme effective in improving the spelling abilities of children with learning disabilities?

The final question intended to discover the effectiveness of the Targeted Revisualisation Programme on improving the spelling abilities of children with

learning disabilities. As such the consistent improvement in contextual spelling, as seen by the gains on the Schonell Graded Dictations, most markedly occurring in those receiving remediation in the form of Traditional remedial techniques indicated its continued usefulness in this regard. Concerning an improvement in one word spelling – as seen by the results on the Schonell One Word Spelling Test – it was found that those children receiving remediation using the Targeted Revisualisation Programme made a greater improvement.

These findings would suggest that the Targeted Revisualisation Programme was partly effective in improving the spelling abilities of grade 4 children with learning disabilities. It showed inconsistent results in terms of the successive processing and integrative skills involved in dictation, but consistent improvement on the more simultaneous and discrete skills involved in one word spelling. The results also indicate that traditional techniques are useful for improving the spelling of words addressed in sequence and placed in context, but would appear to be less useful in situations in which words are singular and not contextualised. These findings would thus suggest that combining the approaches with particular children could produce beneficial and perhaps optimal results.

4.4 Summary

This chapter provided a case by case analysis of each of the subjects in this study. It further outlined the aggregated results of these case studies as separate experimental and contrast clusters and discussed the trends apparent in all eight cases when they were combined to form a single cluster. In conclusion, this chapter related the results

of these analyses to the research questions that had been highlighted in Chapter One. The following chapter will demonstrate the ethical considerations that were followed throughout conducting this research, as well as consider the strengths and limitations of the design and implementation of such a study.

Chapter 5: Discussion

5.1 Ethical Considerations (refer to Appendix U for ethics clearance certificate)

In designing and implementing this study, great consideration was given to ethics, and the importance of adherence to these conditions. In accordance with this, the participant's parents were issued with an information sheet that clearly stipulated what the research involved, explaining the rights of the subject to withdraw at any stage of the research, to not be inconvenienced at any stage, and guaranteeing that all information gathered would remain totally confidential (refer to Appendix B).

Informed consent of the parents of the children in this study was obtained (refer to Appendix C). Care was taken to ensure that the children would in no way be harmed as a result of this study. Care was also taken to ensure that both groups received a similar form of assessment and feedback to either a conventional form of remedial tutoring which targeted the errors they made using phonologically or phonically based teaching strategies, or a form of remedial teaching which involved high imagery teaching techniques.

It will be evident from the results reported in the previous chapter that all the children who participated in the study gained from their involvement. Furthermore, in the writing up of this research attempts were made to ensure that the anonymity of the children remains. This was done by removing identifying information and referring to each child by code. Permission to use the school's facilities was also obtained from Japari (refer to Appendix A), where the tutoring took place in order to ease and

encourage comfort through familiarity with the environment, which should have minimised any unintentional stress caused by the participation in the study.

5.2 Strengths and Limitations

This research has a number of strengths and limitations. For the purpose of this section then these strengths and weaknesses will be highlighted.

The small numbers in the sample dictated that a purely quantitative method was out of the question. There were also areas of the study where the only possible method of data collection that could have been chosen was chosen (as was the case when analysing the child's writing ability where no test could have measured creative writing skills). The study is thus multimethod, but predominantly qualitative and interpretive.

As such, a multimethod approach has been used to counter the weaknesses implicit in the use of single methods and data sources. However, the small number of cases analysed brings with it the strengths and weaknesses associated with a qualitative design. One strength is that a qualitative approach allows the researcher to gather a large amount of information on a few cases, thus allowing them to go into greater depth, as well as get more details on the cases being examined. A weakness however, is found in the fact that generally, because qualitative methods do not allow the researcher to make objective observations. Issues relating to reflexivity and subject-experimenter effects are also pertinent, introducing possible biases into the processes involved in both data collection and analysis.

Based on the small numbers in the experimental and contrast groups, and the predominantly qualitative methodology adopted in analysing and integrating the data, the research may be classified as pre-experimental. There were particular limitations in sampling. Although there was an element of randomisation, this only occurred between already matched pairs, and as such it can be argued that the degree of randomisation as is required to eliminate non-spuriousness was absent.

In addition to this, it may be argued that the contrast group is not considered to be a control group, because the participants assigned to this condition are also expected to make significant improvements with respect to their reading, writing, and spelling abilities. Thus, with no control group and no random assignment, but with an independent variable (the Targeted Revisualisation Programme) the condition for pre-experimental designs is met. This design also brings with it its own strengths and weaknesses. For example a pre-experimental design, whist aiming to establish a trend, may only draw very weak causal conclusions. Thus at best this research can only say that the improvement of reading, writing and spelling abilities is strongly correlated with the Targeted Revisualisation, and that an improvement in memory recall and the use of imagery as a learning aid appear correlated. It would however, be foolish to state a causal conclusion.

Within the pre-experimental design, this research can more specifically be defined as a case study. Strengths - as provided by Smith (1974 as cited in Potter, 2002) - related to such a design include: its usefulness as a method for pilot research as it provides a useful starting point; its undeniable quality because they are based on

actual practice; it is holistic, they summarise particular instances, and explore particular phenomena, events and experiences in detail; they are individualised; they accent process and change over time.

Limitations on the other hand, include: its interpretive and subjective nature; lack of precision due to the greater complexity of field situations; heuristic tendencies; limited wider significance due to lack of scientific vigilance and rigour; as well as fallacies of interpretation.

The research was also longitudinal, and this results in the uncertainty as to how much the post test results are actually indicating a change caused by the Targeted Revisualisation Programme and to how much this change is indicative of the child's mere physical and mental development and maturation. Thus the issue of non-spuriousness is severely compromised as several third/extraneous variables have entered the study.

Threats to internal validity thus existed within the study and can be seen in the following forms:

- Maturation of subjects, which has just been discussed, and which may not assume the same speed in all subjects. This threat – although necessary to mention - is not likely to effect the result of the study too significantly though because this longitudinal approach is unavoidable, as the children need time to use the programme for its results to be identified.

- History – anything could have happened between the pre-test and post test that may influence the child's performance. These could be either positive or negative and affect the child emotionally and cognitively.
- Testing – although slightly controlled for in the design by using several tests and by having six months between the administrations –is another potential threat to the internal validity of this study. This is illustrated by the fact that the same tests and instruments were used at both pre-test and post test levels and thus familiarity, although doubted, may be an issue. Furthermore, not much information is known about the reliability and validity of all the tests, and where the tests were normed outside of the South African context, it is not clear if bias may be involved that might alter the reflection of the child's true scores. However knowing that all the tests are widely used in clinical situations in South Africa minimises the threat which instrumentation may have had on the internal validity of the study resulting in the potentially valid use of tests for the aims of this study. This by implication then impacting positively on construct validity.
- Selection may also prove a threat to internal validity. Although subjects were randomly assigned to either group, their individual learning disabilities may differ slightly, as well as their family life and attitudes. Further more the quality of tutoring received may differ significantly between participants, as this depended on the tutor and their rapport with the child.

Within this study there were also several threats to external validity. Namely ~

- Population validity: this is as a result of the sample being small as well as specific (as seen by the selection procedure that was involved). As a result of the population validity being low, the findings may not be generalisable to the larger

population. The results of the study may thus only cautiously serve as indicators for other children with similar learning disabilities. However the sampling strategy that was employed is the only plausible strategy for this research as probability sampling would have rendered a group where too many third variables would be introduced.

- Ecological validity: because the full sample of eight was taken from the same school, the ecological validity is considered low. Hawthorne effects may also contribute to this low ecological validity if the presence of the tutor during the testing influences the child's results. Furthermore, experimenter effects may have influenced the participant's results and as such compromise the results of the study. In addition to this, the lack of consistency in the one-on-one remedial sessions (particularly those in the contrast condition) with respect to content covered and time on tasks, may have influenced the results, thus compromising the validity of the aggregated clusters. Despite all this, by combining the results of the case by case analyses as part of the research, as well as combining these with previous findings from pilot research, such effects may be counter balanced by other situations
- Temporal validity: although cyclical variation may have been unavoidable due to fatigue and lack of concentration, the study was conduced over the same period of time with all children. As a result the temporal validity may be argued to be fair at least.

Overall, despite efforts that were made to control for confounding variables, it is clear from these limitations that there were several threats to internal and external validity. These, in turn, impact on the generalisability of the study, and prevent the formation

of conclusive results. The value of this research is thus limited to illustrating patterns and trends regarding the use and effectiveness of the Targeted Revisualisation Programme, whilst providing a basis upon which further research may be conducted in order to arrive at less tentative assumptions on the programme's potential to influence the reading, writing and spelling abilities of the child with learning disabilities.

5.3 Suggestions for Further Research

To arrive at less tentative results, this research – just as the pilot studies upon which it builds – may (as mentioned above) thus provide a guide for further studies into the effectiveness of the Targeted Revisualisation Programme. By doing this larger and larger samples will accumulate and thus it opens up the potential for research to be conducted that may aggregate the scores and thus explore the effectiveness of the programme over all. In a similar manner, using this data, as well as the data of pilot studies, patterns of difficulties may be noted and hence, this research may serve as the base upon which further research into the areas of learning disabilities may be developed. Other concepts forming the base upon which further research may be developed from this research study include the long-term gains of children on the programme, the sustainability of such progress, as well as multi-sensory teaching.

5.4 Summary

This chapter outlined the ethical considerations that this research followed in its endeavour to answer the research questions. It further mentioned the possible

strengths of such a design and implementation, and discussed the limitations. From this discussion it was seen that there are several weaknesses to this research. As such the value of this study is limited to illustrating patterns and trends related to the effectiveness of the Targeted Revisualisation Programme and the use of mental imagery. Despite this, the study has provided a basis upon which further research may be conducted in order to arrive at less tentative assumptions on the programme's potential to influence the reading, writing and spelling abilities of the child with learning disabilities. The chapter closed with suggestions for future research and the following chapter will summarise all of the findings bearing what was discussed in this chapter in mind.

Summary and Conclusions

This study has aimed to explore the link between mental imagery and memory and in addition looked at the effectiveness of the Targeted Revisualisation Programme - developed by Prof. Potter of the University of the Witwatersrand - as a methodology for improving the reading, writing and spelling abilities of grade 4 children with learning disabilities. Despite limitations in sample size and research methodology the study did indeed illustrate the usefulness of the programme and indicated that those children trained to use mental imagery appeared to perform better on visual recall tasks suggesting a strong link between mental imagery and memory. Furthermore, it would appear to be clearly indicated from the results of this study that all the children in the sample (i.e. the children in both the experimental and contrast groups) made use of mental imagery as a strategy for learning to a greater or lesser degree. This finding would suggest that mental imagery is a possible strength, which could be used in the treatment of the ever-increasing number of children who are currently being diagnosed as having learning difficulties.

The study used an aggregated case study method to compare the results of children taught using the programme with a contrast group of children who received remediation using conventional remedial teaching based on phonological principles. The results indicated that those children who received tutoring using the programme made improvements in the areas of reading, writing as well as spelling. It was found that those grade 4 children who received remediation using the high imagery teaching techniques used in the Targeted Revisualisation Programme benefited through the

programme's flexibility, which allowed each child's areas of weaknesses – as determined by phonic inventories – to be targeted.

It was also noted that those in the contrast group who received traditional remediation made improvements in reading, writing and spelling. When the improvements were averaged, the results indicated that the children taught using high imagery teaching techniques had made greater improvements in reading, and word spelling, than those taught using conventional remedial teaching techniques but that those children receiving traditional remediation performed better on dictation tasks. These findings highlighting the usefulness of the Targeted Revisualisation programme and suggesting that traditional remedial techniques should not be discarded as they hold merit too.

The literature on children with learning disabilities indicates that their problems are specific, and that not all programmes are effective for all children. Based on the case studies presented in this study, it is reasonable to conclude that high imagery teaching techniques are promising – as imagery appeared strongly linked with memory - and would appear to produce beneficial results in working with children with learning disabilities. It is also possible to state that exposure to the Targeted Revisualisation Programme appears to advantage children who have not learned using other forms of remediation, and that gains were noted in the areas of reading, writing and spelling abilities.

The purposes of this study would thus appear to have been met through the methodologies used in this study, in answering the research questions successfully,

and by exploring the effectiveness of the programme in improving reading, writing and spelling abilities of grade 4 children with learning disabilities. It is also of interest that the results of this study are mostly congruent with previous studies on use of this form of remediation.

In terms of the small sample size in this study, it is recommended that further research on use of the Targeted Revisualisation Programme be conducted. Studies, which aggregate the results of small studies -such as this one - with the results of similar studies, are also indicated. Combining the results of this study with those from other similar studies would then produce an aggregated sample of sufficient size to conduct formal statistical comparisons between children receiving high imagery teaching and those receiving remedial treatment based on phonological principles.

In addition, it is recommended that the area of the sustainability of such gains be further researched, as the programme's effectiveness has not been tested past that of the guided one-on-one tutoring sessions characteristic of such studies. Having researched whether such gains are possible to be maintained in the child's independent work would thus allow one to state with great conviction the strength of such a programme in the treatment of the ever-increasing number of children who are currently being diagnosed as having learning difficulties.

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