

ABSTRACT

A quantitative study was done on children who were diagnosed with Attention Deficit and Hyperactivity Disorders in primary schools. The main aim was to measure IQ and to find out if there are indicators of organicity. The hypotheses of the study were as follows: (i) Children diagnosed with ADHD will obtain lower scores on IQ tests than children not diagnosed with ADHD; (ii) Children diagnosed with ADHD have some form of neurological deficit or organicity. The study consisted of a sample of 25 children who were diagnosed with Attention Deficit and Hyperactivity Disorders and the children who were never diagnosed with the disorder. The sample and the control group range from the age of six (6) to 13 years. Data was collected using Bender Visual Motor Gestalt Test and Senior South African Individual Scale Revised. Descriptive Statistics, Chi-square Test and Mann-Whitney Test were used to determine the difference between the sample and the control group.

The results indicated that there is a significant difference between children with ADHD and the control group on both verbal and non-verbal IQ tests. This means that children who were diagnosed with ADHD scored lower on measures of IQ. The differences may have been due to IQ, or the ADHD group was distracted enough to perform significantly worse on reading, spelling, mathematics, comprehension and written tasks. The results on the Chi-square indicated that there is a relationship between the presence of ADHD and organicity. The findings in this study will aid teachers and parents (especially in African communities), to find out more about the children who they think are just problematic children.

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DECLARATION

I declare that the dissertation for the degree of Masters of Social Science in (Clinical Psychology) in the Department of Psychology in the faculty of Social Sciences at North West University hereby submitted, has not previously been submitted by me for a degree at this or other University, that it is my own work in design and execution and all material contained herein has been duly acknowledged.

Signed: Sepeng Tebogo Onicca

CHAPTER I

INTRODUCTION, HISTORY OF ADHD AND LEARNING DISABILITIES

1. INTRODUCTION

Attention Deficit/Hyperactivity disorder (ADHD) is a commonly diagnosed disorder affecting both adult and school children. ADHD is defined in the DSM IV (1994) as “a persistent pattern of inattention and/or hyperactivity-impulsivity that is more frequent and severe than is typically observed in individuals at a comparable level of development”. It is commonplace for children, especially young pre-school children to be active, energetic and exuberant and to change from one activity to another as they explore their environment and its novelties. If opportunity arises that offers young children the promise of immediate reward or gratification, then their indulgence in these activities is to be expected rather than the restraint of self-control that would be demanded of someone older. These children persistently display level of activity that are far excess of their age group, when they are unable to sustain their attention, interest or persistence as well as their peers with regard to their activities, longer term goal, or to tasks assign to them by others or where their impulse control plus self-regulation lag far behind expectation for their development level, they are no longer simply expressing their adventures that characterised childhood, Barkley (1997).

Individuals suffering from ADHD are instead, highly likely to experience a number of problems in their social, cognitive, academic, familial and

emotional domains of development and adjustment and they are at risk for falling substantially behind other children in their ability to meet the demands increasingly placed upon them for daily adaptive functioning. Highly active, inattentive and impulsive youngsters find themselves far less able than their peers to cope successfully with these developmental progressive towards self-regulation, and a deficient impulse controlling a degree that is deviant if their development levels are given a clinical diagnosis of Attention Deficit/Hyperactivity Disorder, American Psychiatric Association (1994).

ADHD is a persistent and severe impairment of psychological development resulting from a high level of impulsive behaviour, inattentiveness and over-activity or hyperactivity. It is a heterogeneous neurological disorder, with no focal brain damage involved, probably genetic in origin. Within the symptoms of ADHD, impulsiveness is increasingly seen as symptom of greatest significance. According to the DSM IV criteria, it is possible to have ADHD without being inattentive (Meyer, 2000).

ADHD manifests itself before the age of seven years. It often persists into adolescence and adult life and puts sufferer at risk of a range of abnormalities in personality development. Moreover the disorder is associated with a number of complicating features, including neurodevelopmental impairment, impaired intellectual development, scholastic and vocational underachievement and impaired social adjustment (Barkley, 1997). The adverse outcome includes delinquency and other antisocial behaviour and underachievement in school. It has been found that the symptoms of ADHD are caused by dopamine hypofunctioning (Meyer,

2000). ADHD correlates with aggression, conduct disorder, oppositional defiant disorder, learning disabilities, depression, anxiety and low self-esteem (Meyer, 2000).

1.1. What is Attention Deficit-Hyperactivity Disorder?

Attention Deficit-Hyperactivity Disorder is a syndrome, a cluster of symptoms that includes short attention span, difficulty concentrating, poor impulse control, distractibility, moods that changes quickly and in some cases hyperactivity (Friedman and Doyal, 1992). Children who are overactive, impulsive or highly distractible are often more difficult to manage or teach than their less active peers. As a result they are more likely to develop behaviour problems. **According to the DSM IV (1994), there are three types of ADHD:**

◆ **314.01-Attention Deficit/Hyperactivity Disorder, Combined type.**

This refers to ADHD criteria characterised by the six symptoms of inattention, six or more symptoms of hyperactivity/impulsivity which have persisted for at least six months.

◆ **314.00-Attention Deficit/Hyperactivity Disorder, Predominantly Inattentive type.** This subtype should be used if six (or more) symptoms of inattention have persisted for atleast six months; but not as hyperactive and impulsive as in the combined type.

◆ **314.01-Attention Deficit/Hyperactivity Disorder, Predominantly Hyperactive-Impulsive type.** This subtype refers to ADHD children who meet the criteria of hyperactivity and impulsivity (having six or more symptoms) for atleast six months, but do not meet the criteria for inattention over six months period.

Cantwell (1994) and Elia (1993) argued that stimulant medication has been relatively successful in treating these children and improving behaviour. Both describe significant benefits to the children with ADHD, cited by Hotz (1998). At school ADHD children have difficulty including under achievement, failure to complete assign tasks, and poor social skills (Fadely and Holser, 1992). In adolescence those children who have ADHD without aggression, tend to have problems in school performance. Children having ADHD with aggression fair worse and often become involved in nonexemplary groups. According to Hotz (1998), ADHD children perform well in some tasks and poorly in others. Specifically, constantly changing tasks, which are active and response-oriented such as video games, are examples of concentrated non-academic tasks.

According to Barkley and Murphy (1998), there are major characteristics of ADHD, namely:

- **Impaired response inhibition, impulse control, or the capacity to delay gratification.**

These characteristics are often noted in the individual's ability to stop and think before acting; to wait one's turn while playing games, conversing with others, or waiting to wait in line, to interrupt responding quickly when it becomes evident that the individual's actions are no longer effective (Barkley, 1997).

- **Excessive task-irrelevant activity or poorly regulated to the demands of a situation.**

Individuals with ADHD in many cases are noted to be excessively fidgety, restless, and "on the go". Children suffering from ADHD display excessive

movement not required to complete tasks, such as wriggling their feet and legs, tapping things, rocking while seated, or shifting their posture or position while performing relatively boring tasks. Younger children with the disorder may show excessive running, climbing, and other gross motor activity (Barkley, 1997).

▪ **Poor sustained attention or persistence of effort to tasks.**

The problem often arises when the individual is assigned boring, tedious, protracted, or repetitive activities that lack intrinsic appeal to the person. Children with ADHD often report becoming easily bored with such tasks and consequently shift from one uncompleted activity to another without completing these activities. They are easily distracted during periods when concentration is important to the task at hand. Children may also have problems with completing routine assignments without direct supervision and being able to stay on task during independent work (Meyer, 2000).

Behavioural problems arise before age seven and are persistent, developmentally. ADHD is a heterogeneous neurological disorder, with no focal brain damage involve, probably genetic in origin. The disorder often persists into adolescence and adult life and puts sufferers at risk for a range of abnormalities in personality development (Meyer, 2000). Moreover, the disorder is associated with a number of complicating features including; neurodevelopmental, impairments, impaired intellectual development, scholastic and vocational underachievement and impaired social adjustment. That is the adverse outcome that includes delinquency and other antisocial behaviours and underachievement in school (Barkley, 1997). According to Meyer (2000), the symptoms of ADHD correlates with aggression, Conduct

Disorder (CD), Oppositional Defiant Disorder (OD), Learning disabilities (LD), depression, anxiety and low self-esteem.

According to Weller et. al (1998) cited by Brody (2001), children with ADHD often are not engaging, have no peers, are excluded from the group activities as they cannot follow rules and take turns, are quite disorganised, and tend to have low self-esteem. They are often demoralized. ADHD is essentially a low visibility, but high prevalence disorder which permeates every dimension of a child's life and impacts on the family as well (Smith, 1997; Taylor, 1980) cited by Hotz (1998). According to Cantwell (1996), ADHD, in general, reflects poor peer relationships, behaviour problems, fluctuating motivation, high distractibility, limited ability to sustain attention, shifts of attention from one uncompleted activity to another, excessive talking and excessive intrusion onto others by aggressive or non compliant behaviour. ADHD cannot fit into any form of routine, and they are unpredictable in responding to be organized (Ingersol, 1988), cited by Hotz (1998).

The DSM IV (American Psychiatric Association, 1994) provides the following guidelines for the diagnosis of ADHD:

A. Either (1) or (2):

(1) Six (or more) of the following symptoms of *inattention* have persisted for atleast six months to a degree that is maladaptive and inconsistent with developmental level:

Inattention

- a) Often fails to give close attention to details or make careless mistakes in schoolwork, work, or other activities.
- b) Often makes difficulty sustaining attention in tasks or play activities
- c) Often does not seem to listen when spoken to directly
- d) Often does not follow through on instructions and fails to finish school work, or chores (not due to oppositional behaviour or failure to understand instructions)
- e) Often has difficulty organizing tasks and activities
- f) Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
- g) Often loses things necessary for tasks or activities (e.g. toys, school assignments, pencils, books, or tools)
- h) Is often easily distracted by extraneous stimuli
- i) Is often forgetful in daily activities

(2) Six (or more) of the following symptoms of ***hyperactivity-impulsivity*** have persisted for at least six months to a degree that is maladaptive and inconsistent with developmental level:

Hyperactivity

- a) Often fidgets with hands or feet or squirms in seat
- b) Often leaves seat in classroom or in other situations in which remaining seated is expected
- c) Often runs about or climbs excessively in situations in which it is inappropriate (in adolescence or adults, may be limited to subjective feelings of restlessness)

- d) Often have difficulty playing or engaging in leisure activities quietly
- e) Is often “on the go” or often acts as if “driven by a motor”
- f) Often talks excessively

Impulsivity

- g) Often blurts out answers before questions have been completed
- h) Often has difficulty awaiting turn
- i) Often interrupts or intrudes on others (e.g. butts into conversations or games)

B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age seven

C. Some impairment from the symptoms is present in two or more settings (e.g. at school and at home)

D. There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.

E. The symptoms do not occur excessively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorders and are not better accounted for another mental disorder (e.g. Mood Disorder, Anxiety Disorder, Dissociative Disorder or a personality Disorder).

Code based type:

- **314.01 Attention-Deficit/Hyperactivity Disorder, Combined Type:** if both Criteria A1 and A2 are met for the past six months
- **314.00 Attention-Deficit/Hyperactivity Disorder, Predominantly Inattentive Type:** if Criterion A1 is met but Criterion A2 is not met for the past six months

- **Impulsivity/disinhibition**

Disinhibition refers to a deficiency in inhibiting behaviour in response to situational demands, relative to children of the same age or sex. According to Barkley (1997), impulsiveness is reflected in an inability to withhold inappropriate responses, such as premature responding, overrapid responsiveness, and excessive attraction to immediate rewards acting without reflecting, recklessness and impetuous behaviour.

Children with ADHD often interrupt others in conversations, they are less able to resist immediate temptation and delay gratification, they rather settle for smaller rewards that require less work to achieve. They may fail to consider potentially negative, destructive, even dangerous consequences and seem to engage in frequent, unnecessary risk taking (Meyer, 2000). They talk more than others; they often say things without regard for feelings of others or the social consequences to the self. Cognitive impulsiveness implies that events like thoughts and plans are dealt with in short sequences of time with rapid shifts, resulting in problems generating and following plans, problems organizing own behaviour and forgetfulness and inefficient use of time, which are associated with frontal lobe dysfunction (Meyer, 2000).

- **Inattention**

Inattention is a multidimensional construct that can refer to problems with alertness, arousal, selectivity, sustained attention and distractibility among others. According to Barkley (1998), the ADHD child may appear distracted, and is likely to shift “off task” in order to engage the highly rewarding, competing activity. The problem with inattention is witness in

the child's inability to sustain attention or responding to tasks or play activities as long as others of the same age, they are also unable to follow through on rules and instructions. Parents and teachers often complain or report that ADHD children are being disorganized, distracted and forgetfulness.

Complaints of the child's inability to listen, concentrate, failure to finish assignments, change of activities more than other children is also heard from teachers and parents (Barkley, DuPaul and McMurray, 1990) cited by Barkley (1998). ADHD children have also been noted to be slower to return to activity once interrupted and even less likely to return to it than other normal children. According to Barkley (1998), parents and teachers will often describe these attention problems in terms like: "doesn't seem to listen", "fails to finish assigned tasks", "shifts from one uncompleted activity to another", "confused", and "often loses things"

▪ **Hyperactivity or Overactivity**

Hyperactivity or Overactivity is typically seen in restlessness, fidgeting and generally unnecessary gross bodily movements. Taylor (1994), described hyperactivity as persistent, restlessness, inactiveness and impulsiveness manifested in behaviour. Children with ADHD have difficulty in standing, seated where required, moving about, running, climbing more than other children. Parents and teachers describe them as acting as driven by a motor, incessantly in motion, always on the go and unable to wait for events to occur. Restlessness, fidgeting, and generally unnecessary gross bodily movements are common place (Barkley and Cunningham, 1979; Luk, 1985; Steward et. al., 1960; Stili, 1902) cited by Barkley (1998).

Parents often describe children with ADHD as “always up and on the go”, “acts as if driven by a motor”, “climbs excessively”, “on the go”, “talks excessively”, “often hums or makes odd noises”, and are “squirmy” (Barkley, 1998). Observations of such children at school or while working on independent tasks find them out of their seats, moving about the class without permission, restlessly moving their arms and legs while working, playing with objects not related to the task, talking out of turn to others, and making unusual vocal noises (Barkley, 1998). It has been found that children with ADHD are abnormally sensitive to variations in temporal features of attentional tasks and reinforcement schedules. They prefer an immediate reinforcement (reward) and cannot wait for a delay one (Sonuga-Barke, 2000) cited by Meyer, 2000.

1.2. BACKGROUND AND HISTORY OF ADHD

▪ Brain Damage Era (1900-1960)

ADHD has been recognized for over 100 years in scientific literature. In his series of three (3) published lectures to the Royal College of Physicians, Still (1902) (cited by Barkley, 1998) described 43 children in his clinical practice who were often aggressive, defiant, resistant to discipline, and excessively emotional or “passionate” and who showed little “inhibitory volition”. These children also manifested “lawlessness”, “spitefulness”, “cruelty” and “dishonesty”. According to Barkley (1998), Still proposed the immediate gratification of the self as being the “keynote” quality of these and other attributes of the children.

Barkley (1998) further stated that, Still believed these children displayed a major “defect in moral control” in their behaviour that was relatively chronic cases, research noted a higher risk of criminal acts in later development in some, not all. To Still (1902) (cited by Barkley, 1998), the moral behaviour meant “the control of action in conformity with the idea of the good of all”. Moral control was thought to arise out of a cognitive or conscious comparison he termed “moral consciousness”. According to Barkley (1998), Still argued that volitional inhibition and the moral regulation of behaviour were believed to develop gradually in children; therefore younger children would find it more difficult to resist the stimulus to act on impulse than would older children. Still concluded that a defect in moral control could arise as a function of three (3) distinct impairments:

- a) Defect of cognition relation to the environment
- b) Defect of moral consciousness
- c) Defect in inhibitory volition

According to Barkley (1998), Still placed this impairment in a hierarchical relation to each other, arguing that impairments in lower who affect those levels above it and ultimately the moral control of behaviour. Still became the first to compare the ADHD population to a normal population, he was also the first to note the larger proportion of males exhibited the symptoms than females and the age of onset was before eight years of age (Barkley, 1998). In terms of the current terms of the current era, Still’s child population would be distributed among Pervasive Developmental Disorder, Oppositional Defiant Disorder and Conduct Disorders; and his prognosis was permistic (Hotz, 1998). Later, children who became ill with Von Economo’s encephalitis developed motor activity and inattention. According

to Green and Chee (1998), in the 1930's, children with overactivity, impulsiveness and inattention become candidates for the first trial of psychostimulants by Charles Bradley. The description of these clusters of symptoms consolidated over the next few decades, becoming in the 1960's and 1970's "hyperactivity", "hyperkinetic syndrome" and "minimal brain damage". This term was used to denote the fact that most of these children had no overt, gross neurological lesions, but tended to have minor physical abnormalities and poor motor coordination (Hotz, 1998).

According to Hotz (1998), Still sought an organic, genetically based neurological component and he sought an unseen form of brain damage as an explanation for the behaviour. Still believed that a cortical disconnection syndrome was occurring, which promoted defects of control and social abilities. The contribution of Still, however, in a historical context were clearly the cornerstone of the term used later in the 20th century namely, "Minimal Brain Damage" which lasted well into the 1970s (Barkley, 1990), cited by Hotz (1998).

Previously Hartsough and Lambert (1985), (cited by Hotz 1998); have determined that, in comparing hyperactive children with normal children, hyperactive tend to be born after long labour and were twice as likely to have experienced fetal distress. The validity of these classifications and hypotheses was not determined empirically at the time. Most recently a descriptive nosology has developed and operational definitions have replaced less precise/reliable criteria (Barkley, 1997). The DSM III brought a new perspective on the syndrome. ADD (Attention Deficit Disorder) could be diagnosed with or without hyperactivity; introducing the new concept that

activity component may be separate or different from the problems of inattention and impulsivity. Questions about the validity of Attention Deficit Disorders without hyperactivity, as a separate diagnostic category, arose. In 1987 the disorder was renamed ADHD in DSM III-R, which arose from a concern that problems with hyperactivity and impulse control were features critically vital in differentiating the disorder from other conditions. Thus how ADHD was identified with symptoms being impulsivity, inattentiveness and hyperactivity (Hotz, 1998).

▪ **The development of minimal brain dysfunction**

According to Ross and Ross (1982), Still's report (1902) of hyperactivity behavior patterns occurring when brain damage was expected but could not be demonstrated, Tredgold (1908) hypothesized that some forms of brain damage, such as brain injury or relatively mild anoxia, passed unnoticed at the time but became apparent in the form of behaviour and learning difficulties when the child was faced with the demands of early school years. The belief that brain damage could be inferred laid the foundation for the concept of minimal brain damage (Doll, Phelps and Melcher, 1932; Ehrenfest, 1926; Smith, 1926), cited by Ross and Ross (1982). The idea that hyperactivity was caused by minimal brain damage gained the status of an entrenched belief as the result of the publication and minimal stimulation classroom programs of Strauss and his associates (Strauss and Kephart, 1955; Strauss and Lehtiene, 1947), cited by Ross and Ross (1982).

Historically, children with ADHD were referred to as having "Minimal Brain Damage" (1947 to 1950s), Hersen and Ammerman (1995). According to Hersen and Ammerman (1995), the association between brain

damage and behavioural deviance was a logical one and introduced following the 1918 encephalitis epidemics. Many of the post-encephalitic children were observed to be motorically overactive, inattentive, and aggressive, in addition to displaying a wide variety of emotional and learning difficulties (Hersen and Ammerman, 1995). Subsequently attempts to validate the concept of minimal brain damage, however, were unsuccessful. Neither “soft neurological signs”, that is, objective physical evidence that is perceptible to examining physicians as opposed to the subjective sensations or symptoms of the patient, nor a positive history of brain damage or birth difficulties were evident in majority of children with history of behavioural problems.

Barkley (1990) noted that birth trauma, measles, lead toxicity, epilepsy and head injuries were all found to be associated with cognitive and behavioural impairment. The concept of a clinical disorder resulting from brain damage was gradually discarded and replaced with some subtle but nebulous concept, “Minimal Brain Dysfunction” or MBD (late 1950s to mid 1960s), Barkley (1990). The distinction between brain damage and brain dysfunction was an important one. It implies a hypothesis of brain dysfunction resulting from manifestations of central nervous system dysfunction, as opposed to brain damage as an assumed fact in affected children. It also suggests that a wide range of learning and behavioural disabilities could accompany the hypothesized deviation of the central nervous system. These symptoms could be inferred from various combinations of impairment, impulse control, gross activity perception, language, and memory, among others. The concept of minimal brain dysfunction was eventually replaced with the moniker “Hyperkinetic Reaction of Children”, in the American Psychiatric

Association's 2nd edition of its Diagnostic and Statistical Manual (American Psychiatric Association, 1968) cited by Hersen and Ammerman (1995). The concept of an independent syndrome of hyperactivity prevailed between 1968 and 1976, during which time considerable effort was spent trying to validate the notion of a hyperactive child syndrome (Hersen and Ammerman, 1995).

An upsurge in child psychopathology research directly affected the evolution of thinking over this time period and resulted in focus on attentional difficulties or deficits as the core disturbance in the disorder. Excessive gross motor activity was subsequently relegated to an associative feature role in defining the disorder, which in turn, was considered to be neither sufficient nor necessary to establish a formal diagnosis. This rather dramatic shift in diagnostic emphasis was reflected in the third edition of the Diagnostic and Statistical Manual (American Psychiatric Association, 1980), wherein the disorder was renamed "Attention Deficit Disorder" (ADD) and could occur with hyperactivity (ADHD) or without hyperactivity (ADD).

Barkley (1990) points out that the 1980 DSM-III was significantly influenced by Douglas (1972, 1975) but Barkley (1984), Contugno (1993), Wherry, et al. (1993), and Atkins and Pelham (1991), raised the issues as to how and whether an attention focused model could explain the level of behavioural difficulties. Barkley (1990) portrayed ADHD not so much as a hyperactivity or attention disorder, but rather as a disorder of motivation. In the past twenty (20) years, a number of investigations have occurred by the Boston group of Barkley, the Montreal group of Douglas, and in latter years, the Hawaii group of Barkley, and in latter years, the Hawaii group led by

DuPaul. The latter years also saw the intensive drug evaluation studies led by Conners (Conners and Taylor, 1980).

Douglas (Douglas, Bar, O'Neill and Britton, 1988); Werry (Werry and Sprague, 1994), and the concomitant use of rating scales to determine symptoms of hyperactivity. In this area, Conners was the pioneer. From the perspective of behavioural paediatrics and child psychiatry, the intensive investigation of hyperactivity occurred, and the focus, on treatment too became important. Psychology led to the field in cognitive behavioural approaches, and psychiatry and paediatrics applied pharmacological compounds to control symptoms of ADHD (Hotz, 1998).

1.3. In essence, four (4) approaches came to be used:

- Pharmacological approach**
- Psychological approach**
- Educational approach**
- Non-traditional approach**

▪ Pharmacological approach

The usage of stimulants to control symptoms has been the vogue in the 1970's and 1980's (Hotz, 1998). According to Hotz (1998), DuPaul and Barkley (1994), point out that much research has been undertaken on the effects of stimulants on hyperactive children. They argue in favour of medication, notably major doses of methylphenidate that were used subsequently as a means of improving sort term behavioural, academic and social functioning.

DuPaul and Barkley (1994), cited by Hotz (1998), pointed out that heavy dosages of methylphenidate, which were subsequently lowered, appeared to be the most effective usage of the particular drug. With greater public awareness, the short and long term side effects of psychostimulants for ADHD were highlighted. These effects included physiological effects as well as cognitive, academic, behavioural and mood and emotional effects (Swanson, Cantwell, Lerner, and Hanna, 1991) cited by Hotz (1998).

To date, little evidence appears to exist in the issue of addiction. Investigators recognize the requirement, however, to make a sound diagnosis prior to treatment. Evans and Pelham (1991) and Swanson *et al* (1991), cited by Hotz (1998), point out that psychopharmacological approach is directed toward controlling school behaviour, academic performance and social behavioural issues.

- **Psychological approach**

According to Barkley (1990), social interactions between ADHD children and normal children tend to be somewhat weak. ADHD children tend to be rejected by their peers as they lack the natural social skills and know which is necessary for peers' acceptance. It is possible that early childhood problems can be the root cause for later in life maladjustment. Observational studies in classrooms and natural settings portray ADHD children as inappropriate, not "fitting in"; aggressive and often possible as a result engage in solitary play. As a result, social skills training programs have been developed (Barkley, 1990; Braswell & Bloomquist, 1994; Brown & Cantwell, 1976) cited by Hotz (1998).

Peer rejection appears to have been developed over the past fifteen (15) years and continue to be upgraded as more diagnostic criteria becomes available (Hotz, 1998). Long-term programs, and peers to change maladaptive behaviour patterns, seem to be meaningful and their effects last longer.

▪ **Educational approach**

Behavioural and cognitive behavioural interventions in the classroom have been used more recently. Teacher training is deemed important in the success of this approach (Hotz, 1998). According to Hotz (1998), teachers must be fully aware of all the diagnostic issues of ADHD as a disorder. As “ADHD is primarily an impairment in the regulation of behaviour by its consequences and by rules”, the educational approach must implement rule sets and consistently remind the ADHD children of the rules and consequences (Barkley, 1990; Cantwell, 1996; Hallowell & Ratey, 1994) cited by Hotz (1998).

Teachers administered intervention strategies include positive consequences such as ignoring; reprimanding and time-out strategies have been used with some degree of success (Hotz, 1998). Other strategies used educationally include home-based contingency programs, cognitive behavioural interventions, classroom re-structuring, and managing academic programs especially for ADHD children and special placement education services. These programs are implemented at an early age (Hotz, 1998). Behavioural and academic programs may be adapted and “generalized” longitudinally to serve the ADHD child through each stage of life well into adulthood.

▪ **Non-traditional approach**

More recently the ADHD child in the home setting has become a major area of focus (Hchtman, 1996; Johnston & Behrenz, 1993; Mash & Johnston, 1990), cited by Hotz (1998). The Home Situation Questionnaire (HSQ) was developed to rate their ADHD children's behaviour problems in the home sphere (Barkley, 1990; DuPaul & Barkley, 1992), cited by Barkley (1998). It seems evident that parental discipline has difficulty into the daily norms and rules of home life. Often, the parents have difficult time disciplining their troubled children. The "Family System Approach to Parent Training" (Barkley, 1990) is a parent-training program developed to increase the functionality of the family as a whole.

Parent questionnaires are utilized in the form of the Child Behaviour Checklist (Achenbach & Edelbrock, 1983), cited by Barkley (1998). Each section has been developed to objectify, evaluate and correct the issue of parenting where friction occurs. Through a step-by-step process, each session deals with coping, problem-solving, positive and negative reinforcement tactics and other behavioural modification strategies.

The program regarding the traditional approach appears to be widely used and shows a limited degree of success. According to Accardo *et al* (1990) appreciate the clinical implications of neurobehavioural profile readily apparent in developmental disabilities (in children with ADHD), one must first recognise the fact that when neurons are destroyed, dysfunction occurs in three (3) main developmental "streams":

- a) Motor,
- b) Central processing (language and visuomotor or problem-solving),
- c) Behaviour

1.4. Learning disabilities and ADHD in primary school children

Psychoeducational assessment with the Attention Deficit Hyperactivity Disorder child is an integral part of the overall evaluation treatment plan. Most children with ADHD experience some type of learning difficulty. This may range from mild classroom disruption to severe learning disabilities. Because of this, the ADHD child is likely to be referred for some type of psychoeducational assessment. This assessment should focus on providing information that will facilitate adjustment to the educational setting for the ADHD child.

Psychometric tests will be used in order to determine the difference between children with ADHD and the control group. This process will involve Teachers and Parents observations combined with IQ and achievement criteria. The Parent Rating Scale covers the more “internalizing” behaviour symptoms while the Teacher’s Rating Scale covers “conduct problem”, “hyperactivity”, “inattentive-passive” and hyperactivity index. The tests that will be used should be able to answer the research objectives on “what”, “how”, “why” in respect of ADHD and learning experiences. Behaviour ratings can be matched with performance scores to achieve differentiation and eventual concrete diagnostic evidence for ADHD. An understanding of the biological and psychosocial aetiologies of LD and ADHD, the setting that engender and maintain them, their natural history, and what may be the most intervention and prevention strategies for them are of prime importance to all professionals who must deal with these troublesome children (Barkley, 1998).

The specific hypotheses of this study are as follows:

- 1. Children diagnosed with ADHD will obtain lower scores on IQ tests than children not diagnosed with ADHD.**
- 2. Children diagnosed with ADHD have some form of neurological deficit or organicity.**

CHAPTER 2

2.1 LITERATURE REVIEW

According to Weller et al (1998, p190) cited by Brody (2001), children with ADHD often are not engaging, have no peers, are excluded from group activities as they cannot follow rules and take turns, are quite disorganised, and tend to have low self-esteem. They are often demoralised. ADHD may have several different causes. According to Weller et al (1998, p190) cited by Brody (2001), most experts believe it is an inherited, neurobiological disorder. Other possible causes include factors like complications during pregnancy or childbirth, illness, lead poisoning, injury and prenatal drug exposure. Regardless of the cause, individuals with ADHD inherit or acquire brains that function differently from those of the general population (Swartz et al, 1993). The disorder is more common, appears more often in boys than in girls and causes disruption in school and at home (Kaplan and Sadock, 1998).

Besides the primary problems with inattention, impulsiveness and overactivity, children with ADHD may have a variety of other difficulties. They have a higher likelihood of having medical, developmental, behavioural, emotional, social and academic difficulties. Not all ADHD children display all of these problems, but many display them to a degree that is higher than expected in normal children (Barkley, 1990). According

to Fadely and Hosler (1992), “at school ADHD children have difficulties with underachievement, failure to complete assigned tasks, and poor social skills. In adolescence those children who primarily have ADHD without aggression, tend to have problems in school performance. Those having ADHD with aggression fair worse and often become involved in nonexemplary groups”.

2.1.1. THE THREE MAIN SYMPTOMS OF ADHD

According to Barkley (1997), ADHD children are described as having chronic difficulties in the areas of inattention, impulsiveness and overactivity. Impulsiveness, inattentiveness and overactivity are regarded as the main symptoms of ADHD. There is a great deal of overlap between these symptoms, but impulsiveness is increasingly considered a symptom of greatest significance (Barkley 1997).

▪ Impulsiveness/Disinhibition

According to Barkely (1997), the behaviour characteristics of ADHD have been explained as a lack of behavioural inhibition. Impulsiveness is reflected in an inability to withhold responses such as premature responding, over rapid responsiveness, excessive attraction to immediate reward, acting without reflecting, recklessness and impetuous behaviour (Barkley, 1997). Children with ADHD are often noted, clinically, to respond quickly to situations without waiting for instructions to be completed or adequately appreciating what is required in the setting. Careless errors often results, they may fail to consider potentially negative, destructive, even dangerous consequences and seem to engage in unnecessary risk taking behaviour (Barkley, 1990).

Children with ADHD often interrupt others in conversations, they are less able to resist immediate temptation and delay gratification, they rather settle for smaller rewards that require less work to achieve. They are required to wait and watch for events to happen. Children with ADHD talk more than children without ADHD; they often say things without regard for feelings of others or the social consequences to the self (Barkley, 1997). The blurting out of answers to questions, prematurely and the interrupting of conversations of others, is common (Barkley, 1990). The layperson's impression of an ADHD child is often one of the irresponsibility, immaturity, laziness, and outright rudeness.

Goldstein and Goldstein (1990) argued that Attention deficit/Hyperactivity pupils tend to act without thinking. They have difficulty in weighing the consequences of their actions and do not seem to learn from previous experiences. They may be aware of a rule in an actual situation they are unable to control their actions. Impetuous, unthinking behaviour is the result. Impulsivity causes a child to interrupt or jump a line and affects socialization (Goldstein and Goldstein, 1990).

▪ **Inattention**

Inattention is a multidimensional construct that can be referred to problems with alertness, arousal, selectivity, sustained attention and destructibility, among others. Attention problems are typically described as distractibility and trouble with sustaining attention. Children with ADHD tend to behave in inattentive ways but the role of attention in ADHD is quite unclear. Research to date suggests that ADHD children have greatest difficulty with

sustaining attention to tasks (Barkley, 1990). This is most dramatically seen in situations requiring the child to sustain attention to dull, boring, repetitive tasks like independent schoolwork, and chore performing. According to Barkley (1990), it is not so much a problem of heightened distractibility, or ease with which the child is drawn “off task” by extraneous stimuli. The problem appears to be one of diminished persistence or effort in responding to tasks with little intrinsic appeal or minimal immediate consequences.

The ADHD child may appear distracted, and is likely to shift “off tasks” in order to engage the highly rewarding competitive activity. They also are unable to follow through on rules and instructions. Parents and teachers will often describe these attention problems in terms like: “doesn’t seem to listen”, “fails to finish assigned tasks”, “shift from one uncompleted activity to another”, “confused”, “often loses things” (Barkley, DuPloy & McMurray, 1990), cited by Barkley (1997). ADHD children have also been noted to be slower to return to an activity once interrupted and even less likely to return to it than other normal children.

- **Hyperactivity or Overactivity**

Hyperactivity refers to excessive and developmentally inappropriate levels of activity. Hyperactivity or Overactivity is commonly seen in ADHD children, it is typically seen in restlessness, fidgeting and generally unnecessary gross bodily movements. Taylor (1995) described hyperactivity as persistent restlessness, inactiveness, and impulsiveness manifested in behaviour. Children with ADHD have difficulties in staying seated where required, moving about, running, climbing more than normal children. Parents and teachers describe them as acting as driven by a motor,

incessantly in motion, always on the go and unable to wait for the events to occur. Research objectively documents them to be more active than other children to be less mature in controlling motor overflow movements to have considerable difficulties with stopping an ongoing behaviour (Taylor, 1995). Observing the child at school, or working on independent tasks, finds him or her, out of seat, moving arms or legs while working, playing with objects not related to the tasks, talking out of turn and making running commentary on activities around them (Barkley, 1990).

2.1.2. SOCIAL IMPLICATIONS OF ADHD

▪ Academic performance

According to Cotugno (1987), (cited by Croeser, 1998); hyperactivity children perform similarly to other children on intellectual Quotient in early grades, but in later grades they perform significantly lower than control groups. Academic failure is therefore common. Studies quoted by Cotugno (1987), (cited by Croeser, 1998); indicated that Attention Deficit/Hyperactivity Disorder pupils learn at a slower rate than expected on the basis of IQ score (Cantwell and Satterfield, 1978).

Often the work tempo in regular class is of such a nature that the child cannot keep up. They are therefore often placed in “special education classes” or even different schools. It is common for Attention Deficit/Hyperactivity pupils to repeat classes. Wicks-Nelson and Israel (1991), reported that by the time they reach adolescence, 50 to 60 percent have repeated at least one grade. Due to academic failure, and because many Attention Deficit/Hyperactivity pupils perform less well than would be predicted from their general intelligence, many are said to display learning

disabilities. Estimates of the percentage of Attention Deficit/Hyperactivity pupils who have learning disabilities, from nine to twenty percent depending no doubt on actual differences among the samples as well as on varying criteria for the two disorders (Wicks-Nelson and Israel, 1991).

According to Abikof (1991), (cited by Croeser, 1998), Attention Deficit/Hyperactivity pupils often display scholastic difficulties. Problems that are frequently encountered are: poor grades and test scores, homework problems, and grade retention. Their academic impairment is multifaceted and stems typically from a combination of skill deficits, as well as inefficient perceptual search strategies and an impulsive problem-solving style that is associated with careless, disorganized, inaccurate work. Abikof (1991) stated that in spite of mounting evidence that stimulants improve academic productivity and task performance, the impact of medication on academic skill acquisition and achievement has not been established. It appears as though certain aspects benefit to a degree but no long-term cognitive adjustment takes place.

▪ **Social Problems**

Social adjustment is a problematic area for the child and often affects adult life. The social aspects are of the serious nature pervading their everyday lives and giving lives to conflict and confrontations. Hynd et.al. (1989), found that Attention Deficit/Hyperactivity pupils displayed more conduct problems and were unpopular and guiltless. In contrast to the latter, Hynd et.al. (1989), concluded that pupils with Attention Deficit disorder without hyperactivity were more anxious, shy and socially withdrawn, while hyperactive children are said to be more outgoing (cited by Croeser, 1998).

According to Spivack and Shure (1974), cited by Croeser, 1998; the aspects of importance that were singled out (in the research of social adjustment) are: sensitivity to human problems, ability to imagine alternative courses of action, ability to conceptualize means to solve a problem, and sensitivity to consequences and cause and effect in human behaviour. Two key abilities were emphasized: the ability to imagine alternative solutions to problems, and the ability to conceptualize means and potential obstacles in moving toward a goal. Spivack and Shure (1974) cited by Croeser, 1998; hypothesized that the personal adjustment of young children can be enhanced if they are trained to see human problems more clearly, taught different ways of handling them and given greater sensitivity to the potential consequences of what they do.

Hyperactive children tend to be perceived as annoying and aversive or, as immature and maladroit (Whalen and Henker, 1991). They are unaffected by the social codes and situational cues that are the norm in society and are said to be at the hub of disruption (Whalen and Henker, 1991). These children are soundly and roundly rejected by peers, receiving the most negative scores with regards to socialization. Two fundamental problems singled out by Whalen and Henker (1991) are: aggressive acts and violations of social norms. They ascribe the incidence of the latter to three hypotheses. The first hypothesis is that children with Attention Deficit/Hyperactivity Disorders process social information inadequately. In the second place, it is hypothesized that hyperactive children lack age-appropriate interpersonal skills, including the inability to initiate and disengage from social encounters. In the third place it is maintained that these youngster's

behaviours are atypical as far as social aspects are concerned, and they pursue goals that are considered unsuitable.

- **Peer relations**

The peer relations of both normal and emotionally or behaviourally disturbed children has emerged as an important area of study in recent years, perhaps in recognition of the role of peer relations in the prediction of long-term adjustment (Parker and Asher, 1987) cited by Braswell and Bloomquist (1991). According to Pelham and Bender (1982) cited by Hernsen (1989), hyperactive children have a bossy, uncooperative, aggressive, and bothersome interpersonal style and are viewed by their peers as deviant and problematic. Hernsen (1989), stated that immature, negative, attention-seeking behaviours as well as unpredictability, attempts to dominate peers, and temper outbursts lead to rapid identification and rejection by peers. Hyperactive children receive more active rejection by peers than do children without hyperactivity (Hernsen, 1989).

- **The effect of the ADHD child on the family**

The extraordinary expenditure of time and energy required for parenting an ADHD child, often with few or no measurable results, imposes stress in marital relationships and undermines the family harmony (Moghadam, 1988). Moghadam (1988) also mentioned that the conflict and confusion between parents on discipline and how they should respond to the child's demands and annoying behaviour can adversely affect the best parenting intentions. Siblings of an ADHD child often feel neglected due to the attention focused on the ADHD child and are resentful of the different behavioural expectations within the family. According to Moghadam (1988),

the siblings often feel that the ADHD child is the instigator of the conflict or blame him unfairly. The parents, caught in this dilemma, find it difficult to respond rationally in resolving sibling conflicts. Over time, the growing sense of helplessness and frustration can evolve into resentment towards the ADHD child and may increase risk of parents losing control and physically or emotionally harming the child.

2.1.3. PSYCHOLOGICAL ASPECTS OF ADHD

▪ Self esteem issues

According to Wordrich (1994), children with ADHD are more subject to poor self-esteem than typical children. As adults they have more depression related problems, such as severe discouragement and demoralization. The child's lowered self-esteem is a major concern for their parents. The ADHD child often does not see the connection between his or her behaviour and the reaction of others (Moghadam, 1988). Their annoying behaviour frequently leads to rejection by siblings and peers who do not hesitate to "pick on" them whenever the opportunity arises (Moghadam, 1988).

▪ Behaviour problems

Abikof (1991), listed the reasons for referral of children as being non-compliance, excessive and inappropriate verbalisations, not completing or attending to tasks, and disturbing other children. Intrusiveness, bossiness as well as aggressive behaviour and poor social skills; these aspects hamper forming of peer relationships and often lead to outright rejection (Abikof 1991).

2.1.4. THE NEUROPSYCHOLOGY OF ADHD AND RELATED DISORDERS

2.1.4.1. ETIOLOGY AND NATURE OF ADHD, ODD AND CD

ADHD may have several different causes. Most studies that have been conducted emphasize that ADHD has a genetic factor. Family and twin studies provide convincing evidence for a genetic component in ADHD (Cantwell, 1997). There is no focal brain damage involved it is most likely a genetic factor, mainly giving rise to dopamine hypofunctioning cause the behavioural symptoms. Dopamine dysfunction plays a vital role in the neurobiology of ADHD (Sagvolden and Sergeant, 1998).

Also some environmental pollutants may cause dopamine dysfunction (Holelne et al., 1995). The concentrations and types of these pollutants may vary between countries and regions within a country (McFarland and Clarke, 1989). Polychlorinated biphenyl's (PCBs) constitute a group of halogenated aromatic hydrocarbons that is lipophilic and, consequently, is bioaccumulating (Holelne et al., 1998). The lipophilic nature of PCBs makes organs like the brain particularly vulnerable. Intake of these pollutants causes developmental abnormalities in humans including low birth weight, disruptive behaviour and overactivity (Seegal, 1996).

A series of studies of effects of PCB exposure on behaviour and brain chemistry (Holene et al., 1995,1998) showed that normal male rats exposed to sub-toxic doses of PCB congener 153 through mother's milk when pups, were hyperactive and impulsive after they grew up. Their behaviour was

closely similar to that shown by the animal model of ADHD (Sagvolden, 2000). Although the various PCBs work via different routes, the most likely mode of action of di-ortho-substituted PCB congeners like PCB 153 producing hyperactivity and motor impulsiveness is via monoaminergic pathways. Dopamine and serotonin levels are reduced (Chu et al., 1996) probably by a combination of an inhibition of dopamine synthesis and deficient vascular storage or release (Chishti et al., 1996).

Other possible causes of ADHD include factors like complications during pregnancy or childbirth, illness, lead poisoning, injury and prenatal drug exposure. Regardless of the cause, individuals with ADHD inherit or acquire brains that function differently from those of the general population.

▪ **Prevalence**

ADHD affects between 2% and 5% of primary schoolchildren (Swanson et al, 1998). In childhood, the disorder is more common in boys than in girls, but during adolescence and young adulthood, the proportion of females affected increases (Biederman et al., 1994). The prevalence of ODD reported in epidemiological studies ranges from 0.3% to 22.5%, with the median being about 3.2%. A wide range of estimates of the prevalence of CD has been reported, ranging from 0.0% to 11.9% for girls and combined. The purpose of this study is to determine the relationship between ADHD and learning disabilities.

▪ **Neurobiology of ADHD**

Dopamine is a neurotransmitter or brain messenger that travels across synapses in the brain (Loebenstein, 1999). ADHD at a neurobiological level

may be caused by the hypofunctioning dopamine systems (Swanson, 1998). According to Sagvolden et al (1999), "dopamine is a neuromodulator that serves to modulate action of neurotransmitters like glutamine". Sagvolden (1999) further said that this hypofunctioning of the dopamine system leads to the impairment of the conduction of the non-dopaminergic inputs in the frontal cortex, the nucleus accumbens, and the neostriatum. The dopaminergic system does not operate in isolation; it is closely linked to other neurotransmitters and the neuro-modulators. Dysfunction in the meso-lymbic dopamine pathway, give rise to deficient sustained attention, hyperactivity and impulsiveness (Sagvolden et al., 2000).

It is generally agreed that the pattern of symptoms of ADHD is mediated by some abnormalities in brain functioning. ADHD seems mainly, but not exclusively to be associated with reduced metabolism and volume of right frontal cortex and right subcortical structures, smaller total cerebellum as well as reduced corpus callosum (Oades, 1998; Solanto, 1998). There are many competing hypotheses about the specific cognitive process implicated in ADHD. One is the frontal lobe hypothesis, which suggests that ADHD is the result of a general disorganization in behaviour linked to the problems of inhibition that are mediated by a genetically based abnormality in the functioning of the frontal structures responsible for so-called executive functions (Sagvolden et al., 1998).

Benson (1991) argues that prefrontal dysfunction appear to be a factor in ADHD as reflected in impairment in executing the functions that require the functioning of the frontal lobes. He found that ADHD children have the following deficits; failure to sustain attention, vigilance and concentration

are also impaired, failure to handle serial information, failure to control the drives which leads to a decreased activation, apathy, failure to perform executive functions of the frontal lobes (e.g. thinking before acting, inability to anticipate one's own future effects on action and needs).

Benson (1991) was supported by Barkley (1997) who argued that there is no single brain part that is responsible for ADHD as a consequence of its lesions, but that genetic factors may influence the developmental constructions of the brain. According to Barkley (1997) the effectiveness of the neurotransmitter structures contribute to ADHD. Frontal lobes, particularly the prefrontal cortex and its interconnections with striatum (part of the brain that controls movement in specific and behaviour in general) are likely to be involved in ADHD. These neuroanatomical structures mediate the genetic influences. Barkley (1997) argued that the role of the prefrontal cortex in ADHD is shown by poor performance on some neurological tests associated with the functions of prefrontal lobe, such as verbal fluency, inhibition, persistence, motor control, motor fluency and working memory.

Smaller corpus callosum (nerve fibres that connect the hemispheres of the brain and help in the interhemispheric transfer of information) was observed by Hynd et al (1991) in Barkley (1997), in ADHD children. Lack of cerebral asymmetry where the right part of the brain is smaller than normal is believed to mediate ADHD (Castellanos et al, 1996 in Barkley 1997).

▪ **Dopamine dysfunction**

Dopamine, like the other monoamines, is a neuromodulator that serves to modulate the actions of neurotransmitters like glutamate. The dopaminergic

system has two main branches: the meso-limbo-cortical originating in the ventral tegmental area projecting to the prefrontal cortex, the nucleus accumbens septi, the olfactory tubercle; and the nigro-striatal branch originating in the substantia nigra and projecting mainly to the neostriatum (the caudate-putamen complex) (Johansen et al., 2002). An imbalance in dopamine transmission in these branches leads to imbalances in other neurotransmitter systems producing specific behaviour effects related to the different systems and depending on situation fluctuations (Johansen et al., 2002).

There are five distinct dopaminergic receptors coded by five different genes (D-1 to D-5). These are grouped into two families: D-1/D-5 and D-2/D-3/D-4 (Carey et al., 1998). ADHD seems to have genetic components associated with genes coding for receptors in the dopamine D-2 family and membrane dopamine transporter (DAT) proteins (Cook et al., 1995; LaHoste et al., 1996). In an animal model (Russell et al., 1998) there might be an impaired vesicular storage. It is, however, unlikely that any one gene will account for the whole of the ADHD syndrome (Taylor, 1998).

a) The meso-limbic dopamine branch

A dysfunctioning meso-limbic branch in ADHD may alter reinforcement and extinction signals and thereby be the neurobiological foundation of the altered reinforcement process repeatedly suggested as one factor in ADHD symptomatology (Douglas, 1983, 1994; Sagvolden, 1989, 1996, 1998; Sonuga-Barke et al., 1992). Children with ADHD have a shorter delay of reinforcement gradient than normal. This is caused by the reduced tonic dopamine levels, which affect the dopamine receptor associated on channels

for reinforcement. A dysfunctioning meso-limbic dopamine branch caused by a reduction in both tonic and phasic dopamine levels will produce altered reinforcement, on a behavioural level giving rise to a deficient sustained attention, hyperactivity and motor impulsiveness (Schultz, 1998).

b) The nigro-striatal dopamine branch

Children with ADHD may show several motor problems: longer and more variable reaction times (Brandeis et al., 1998; Oostelaan and Sergeant, 1998; Rubia et al., 1998), increased variability in speed and less accurate response re-engagement (Oostelaan and Sergeant, 1998), and impaired orienting responses and an increased number of responses with very long reactive times (Douglas, 1999). ADHD children with a pervasive problem are more likely to show language and motor delays and to have an onset in the first two years of life (Johansen et al., 2002; Taylor, 1998).

A dysfunctioning nigro-striatal dopamine branch will cause several “extrapyramidal” symptoms (neurologic ‘soft signs’) associated with ADHD in the form of impaired timing and force regulation of muscle groups: poor motor control (clumsiness), longer reaction times, poor response timing, abnormal control of eye saccades, poor handwriting, poor correlation of the activity of different body parts (Kadesjo and Gillbert, 1999). Thus, findings previously attributed to response disinhibition due to frontal-lobe dysfunction may rather be due to impaired motor control associated with dopamine dysfunctioning of the neostriatum (Douglas, 1999; Sagvolden, 1989, 1996, 1998).

▪ **Brain imaging in ADHD**

Neuroimaging studies make it possible to test neurobiological theories about the causes of ADHD. CAT scan studies have not found differences between ADHD and normal children in overall brain structure (Shaywitz et al., 1983). However, recent MRI studies suggest structural abnormalities in two primary brain regions: the corpus callosum and the frontostriatal circuitry. Most studies have found that individuals with ADHD have a smaller corpus callosum – the area of the brain that assists with the transfer of information between hemispheres – although findings are inconsistent with respect to the specific regions involved (Baumgard et al., 1996; Castellanos et al., 1996a).

Other MRI studies have focused on the structure of the frontostriatal circuitry (prefrontal cortex and basal ganglia). These areas of the brain are associated with attention, executive functions, delayed responding, and response organization (Castellanos et al., 1996a). Lesions in this region are associated with symptoms similar to ADHD. Children with ADHD have been found to have a smaller right prefrontal cortex than those without ADHD (Filipek et al., 1997)

Castellanos (1999) assumes that they have identified the brain circuitry and the neuronal pathways that control the brain braking mechanism. This pathway consists of two pathways: one referred to as indirect pathway and the other as direct pathway. Inadequate inhibitory activity in the indirect pathway is believed to contribute to a number of disorders, including ADHD, Tourette's syndrome and Obsessive Compulsive Disorder. Drafting a model of ADHD requires understanding normal brain development, most dramatic features of which is a relative increase of inhibiting messages with

increase maturation. This maturation is paralleled by decreases in dopamine concentrations in the brain.

▪ **Genetic factors**

Although specific genetic abnormalities are rare in children with ADHD, other lines of evidence point to heredity as an important causal factor. First, ADHD runs in the families (Hectman, 1994). Some parents of children with ADHD may not initially see their child's behaviour as a problem, because it so closely resembles their own. As many as 35% of the immediate and extended family members of children with ADHD are also likely to have ADHD, including 32% of siblings (Faraone and Biederman, 1994; Faraone, Biederman and Milberger, 1996). Of fathers who had ADHD as children, one-third of their offspring has ADHD (Biedeman et al., 1992).

Joseph (1992) highlighted that it is evident from a number of different studies that ADHD may at times be inherited as well as acquired. The frequency of ADHD in parents, siblings, identical (monozygotic) and nonidentical (dizygotic) twins, and adopted children all indicate that genetic factors are among the possible causes of brain dysfunction that may lead to ADHD. According to Kaplan and Sadock (1998), the genetic basis of ADHD includes a greater concordance in monozygotic twins than in dizygotic twins. There is now abundant evidence that genetic factors are principal in the aetiology of ADHD (Biederman et al, 1997). It is also stated in the Synopsis of Psychiatry that siblings of the hyperactive children have about twice the risk of having the disorder, as does the general population. Barkley (1997) "argued that ADHD runs in the families and is more in the

biological relatives. He argued that if one parent has the disorder, this puts a child at risk of 57% to developing ADHD”.

Studies that have looked for specific genes associated with ADHD have focused on those within the dopamine system, for two primary reasons. First, medications that reduce ADHD symptoms act primarily on the dopaminergic and noradrenergic systems. Second, brain structures implicated in ADHD are rich with dopamine innervation. Early research implicated the dopamine type two genes and its increased association with alcoholism, Tourette’s disorder, and ADHD (Comings et al., 1991). However, findings related to this gene have not been replicated (Barkley, 1996).

Preliminary studies have found a relationship between the dopamine transporter gene (DAT) and ADHD (Cook et al., 1995; Gill et al., 1997), although these findings are based on small samples of children with high levels of comorbidity and need to be interpreted cautiously. However, the dopamine transporter gene is of particular interest because many drugs used to treat ADHD inhibit the dopamine transporter.

Despite their preliminary nature, the findings that implicate genes within the dopamine system in ADHD are intriguing and consistent with a model suggesting that hypo-dopaminergic activity may be related to the behavioural symptoms of ADHD. In the vast majority of cases, the heritable components of ADHD are likely to be polygenic, the result of multiple interacting genes on several different chromosomes. However, the connection of even a single gene and ADHD in a small minority of

individuals is of interest in linking the behavioural deficits to a single protein (Mash and Wolfe, 1999).

▪ **Environmental toxins**

Environmental factors that are known to cause ADHD include the effects of foetal exposure to alcohol and benzodiazepines (Taylor et al, 1998). Diseases affecting the brain, some forms of psychosocial adversity including institutionalization and failure to attachment, idiosyncratic reactions to food and exposure to toxic levels of lead and pollutants, are also known associations that are considered to have aetiological importance (Taylor, 1998). ADHD is not produced by only the genetic factors but also by other agents altering dopaminergic functioning. Chronic intake of dopamine agonists like cocaine, crack and amphetamines will produce a down regulation of dopamine synthesis.

Amphetamines cause the release of dopamine and cocaine the uptake of dopamine. They will produce a down regulation of dopamine synthesis, i.e. the dopaminergic axon terminal is the site of synthesis for dopamine. Once dopamine is produced, it is taken into the synapse vesicle by specific transporters and then released into the synaptic cleft on depolarization of the axon terminal, e.g. agents like crack, and cocaine retards the re-uptake of dopamine. The transporter molecule responsible for dopamine re-uptake contains a cocaine-binding site. When cocaine binds with this site, the channel force which, the transporter is blocked becomes inactive and no longer carries dopamine into the terminal button (Taylor, 1998).

2.1.5. ASSOCIATED FEATURES OF ADHD

Although ADHD is defined by the presence of the major symptoms as impulsiveness, inattention and hyperactivity, research has found that such children often demonstrate a variety of other difficulties. Oppositional Defiant Disorder (ODD) and Conduct Disorder (CD) are very common in ADHD, which are not seen as a differential diagnosis, but as a complication (Taylor et al, 1998). The combination of ADHD and another problem seriously complicates the situation for the child and family (Mash & Wolfe, 1999).

ADHD, ODD, and CD tend to run in families, which suggest a common causal mechanism (Biederman et al., 1992). On this basis, some have argued that ADHD symptoms and conduct problems are different expressions of the same disorder. However, ADHD is usually associated with cognitive impairments and the neurodevelopmental difficulties, whereas conduct problems are more often related to family adversity, parental psychopathology, and social disadvantage (Schachar & Tannock, 1995).

▪ Oppositional Defiant Disorder (ODD)

ODD, according to DSM IV (American Psychiatric Association, 1994), is a pattern of negativistic, hostile, and defiant behaviour lasting at least six months in which at least four of eight criteria are present. A criterion is considered to be met, only if the behaviour occurs more frequently than observed in individuals of comparable age and developmental level and the disturbance causes clinically significant impairment in social, academic or occupational functioning. Nearly half of all children with ADHD-mostly boys-have Oppositional Defiant Disorder. Children with ODD overreact,

lashing out at adults and other kids, for example, shoving a child who accidentally bumps into them. Children with ODD are stubborn, short-tempered, defiant and combative. Between 35% to 60% of clinic-referred children with ADHD also meet criteria for the diagnosis of ODD by 7 years or later (Barkley, 1990; Biederman, Faraone, & Lapey, 1992).

▪ **Conduct Disorder (CD)**

According to the DSM IV (1994), "CD described as a persistent pattern of behaviour in which the basic rights of others or major age-appropriate societal norms or rules are violated". Diagnosis requires the presence of three or more symptoms in the past 12 months with at least one symptom present in past six months. There must be present clinically significant impairment in social, academic, or occupational functioning. Sometimes, ODD progresses to Conduct Disorder (CD), which is a more serious condition. Children with CD violate societal rules and are at risk of getting into serious trouble at school or with the police. They may fight, cheat, steal, set fire, destroy property or use illegal drugs. About 30% to 50% of children with ADHD eventually develop CD (Barkley, 1990; Biederman et al., 1992), cited by Mash & Wolfe (1999).

Therefore, it is important for the purpose of this research study to apply all recent and previous findings relating ADHD and related disorders to problems encountered in the South African context. The relevance of findings seems to reflect similarities in the South African environment.

2.2. LEARNING DISABILITY

There is little knowledge about learning difficulties and ADHD. It is presumed that ADHD children are more likely, than normal children, to have learning disorder (LD). LD is defined as a significant discrepancy between one's intelligence/general mental abilities on the one hand and one's academic achievement such reading, math, spelling, handwriting and language, on the other (Barkley, 1990). Taylor et al (1998), defines LD as any neurodevelopmental delays such as language delays such as language delays and sensory motor coordination, which is often impaired and the ability being below chronological age.

The association between learning disabilities (LD) and ADHD in children has been known and described since the 1970's. Comorbidity rates have longed for 10%- 92% (Biederman et al., 1991). Shaywitz and Shaywitz (1994) noted that the diagnosis of ADHD is established on the basis of history of inattention, impulsivity and hyperactivity, whereas the diagnosis of LD is made on the basis of a discrepancy between tests of ability (e.g. IQ) and performance on the test of achievement. They conclude that naming and linguistic fluency deficits reflect reading disability, whereas verbal learning and memory deficits are linked to attention disorder. Barkley (1997) said that children with ADHD are more likely to have LD than normal children. Barkley (1997) defines LD as a significant discrepancy between one's intelligence or general mental abilities on the one hand and one's academic achievement such as reading, math, spelling, handwriting and language on the other hand.

Anderson et al. (1987) defined LD as being at least two years behind in reading, spelling, math or written language, and this was found in 50% of ADHD children. Taylor et al. (1988) defines LD as any neurodevelopmental delays such as language delay and sensory motor delays, sensory motor coordination, which is often impaired, and the ability being below chronological age.

2.2.1 Associated cognitive impairments

▪ Metacognition and Executive functions

Children with ADHD often have deficits in metacognition and executive functions (Pennington & Ozonoff, 1996). These are higher-order mental processes that underlie the child's capacity for self-regulation, such as self-awareness, planning, self-monitoring, and self-evaluation.

▪ Metacognition

Metacognition refers to the child's awareness of his or her own thought processes, or "knowing about knowing" (Welsh & Pennington, 1988).

▪ Executive functions

Executive functions typically refer to the child's ability to maintain a problem-solving set in order to attain a future goal (Welsh & Pennington, 1988). These functions include:

- ❖ *Cognitive* processes, such as working memory and mental computation, planning and anticipation, flexibility of thinking, and the use of organizational strategies;
- ❖ *Language* processes, such as verbal fluency, communication, and the use of self-directed speech;

- ❖ **Motor** processes, such as allocation of effort, following prohibitive instructions, response inhibition, and motor co-ordination and sequencing; and
- ❖ **Emotional** processes, such as self-regulation of arousal level and mature moral reasoning.

Children with ADHD consistently show deficits in executive functions related to motor inhibition (Pennington & Ozonoff, 1996; Barkley, 1999).

2.2.2 Causes of learning disabilities

▪ Genetic Factors

Genetic factors seem to play a role in causing learning disabilities. Studies have found that 88% of children with dyslexia had family members with dyslexia. Studies of twins have demonstrated evidence of genetic etiology. In a study of 33 pairs of fraternal twins, 11 sets had learning disabilities. This shows that genetic factors play a role in causing learning disabilities (Kolb and Whishaw, 1996).

▪ Structural Damage to the Brain

Learning disabilities can be caused by damage to some structures of the brain. Damage to those special areas of the cerebral cortex which deals with recognition, interpretation, encoding and reproduction of written symbols and their transmission in the spoken world can cause learning disabilities. The effect of brain damage depends on the size of the lesion and the age of the person, and the structural damage can affect the individual over a broad area of learning (Kibel, 1993).

The structural damage that leads to LD can be caused by injury or disease including traumatic brain injury, birth injury, anoxia and encephalitis (Kibel, 1993). Some prenatal and postnatal factors contribute to the damage of the brain, which can lead to LD. Most children with LD are more often to be born from complicated pregnancies. LD is also caused by damage in the angular gyrus, which can disconnect the systems of auditory and written language (Kolb, 1996). Damage in the occipital temporal region can lead to specific learning disabilities, which involve memory loss (Taylor, 1999).

▪ **Brain Dysfunction**

The dysfunction of the secretion of neurotransmitters and neurohormones can lead to LD. In the region of the substantia nigra, the dopaminergic (DA) nigrostriatal system affects motor balance and effectual response. The dysfunction in this site can cause Parkinson's disease, which can result in memory problem and later cause dyslexia (Kibel, 1993).

2.2.3 Types of learning disabilities

▪ **Verbal Learning Disabilities**

Verbal learning disabilities are characterized by difficulty in language. The most common types of disabilities include dyslexia and language delay (Kolb et al., 1996). Dyslexia (inability to read) is one of the most common types of learning disabilities. Individuals with dyslexia are unable to read things even if they are not blind or deaf (Engelbrecht et al., 1996).

The delay in the development of speech is another problem in individuals with learning disabilities. The disability may occur at the level of perception, imagery, symbolization and conceptualization (Gearheart et al., 1989).

Children with language delay are not able to develop their language system in time, which include morphology, syntax, semantics and pragmatics (Lerner, 1993).

▪ **Non-verbal Language Disability**

Non-verbal learning disabilities are characteristic of children who have difficulty in comprehending aspects of their environment, in pretending and anticipating, and in interpreting the facial and emotional gestures of others. Whereas children with non-verbal disabilities have little difficulty with the superficial aspects of speaking and reading, they do have difficulty with the deeper meanings of language. Such children are often immature and have difficulty making the judgments needed to succeed in life (Kolb and Whishaw, 1996).

These deficits involve social skills, spatial orientation, problem solving, and the recognition of non-verbal cues such as body language. In addition to math deficiencies, non-verbal leaning disorders are characterized by several neuropsychological patterns (Lyon, 1996):

Bilateral tactile deficits

- ❖ *Bilateral psychomotor co-ordination deficiencies*
- ❖ *Deficiencies in visual-spatial-organizational abilities*
- ❖ *Deficits in non-verbal problem solving, judgement, and reasoning*
- ❖ *Relative strengths in verbal abilities and reading*
- ❖ *Difficulties adapting to novel and complex situations*
- ❖ *A tendency to communicate in a rote and repetitive manner*

- **Hyperactivity**

The hyperactive child syndrome is distinguished from other types of LD in that the child has a behavioural problem in school and all aspects of school performance are usually disrupted. Hyperactive children may have specific LD in addition to hyperactivity, and may contribute to hyperactivity. A number of diagnostic labels have been given to this disorder, including minimal brain dysfunction, hyperkinetic child syndrome, and hyperkinetic impulsive disorder (Kolb and Whishaw, 1996).

2.3. CONCEPTUAL APPROACHES OR MODELS OF LEARNING DISABILITIES

The types of individual treatment methods that are applied to individuals with Learning Disabilities are influenced significantly by the conceptual approach or model that is used to formulate the rationale, purpose, and outcomes of the treatment (Mash and Barkley, 1998).

- **The Medical or Etiological Model**

According to Mash and Barkley (1998), Learning Disabilities are viewed by the medically oriented approaches as overt symptoms of underlying biological pathology. The inferred pathology was conceptualised by different theorists as affecting, for example, language development, perceptual system, perceptual motor organization, and ocular-motor functioning. For example deficit oral language could be described as a primary language disorder due to organic impairment resulting from putative anoxia (Mash and Barkley, 1998). Recommended treatment might involve patterning exercises to “stimulate” brain regions, thought to sub serve the

language process in question (Mash and Barkley, 1998). Pre-natal, peri-natal and post-natal problems such as maternal measles during gestation, problems of birthing such as brain damage from the use of forceps, or the use of soy-based formula with excessive manganese after birth, can be responsible for the onset of learning disabilities. Certain vaccinations may also cause problems (Nigg J.T. et.al, 2004).

▪ **Psychoeducational or Diagnostic-Remedial Model**

Proponents of psychoeducational models of LDs interpreted academic deficits as reflecting aberrations in the ability to perceive, integrate, and remember auditory and visual information, associated with the development of listening, speaking, reading, and writing behaviours (Frostig, 1967; Kirk&Kirk, 1971), cited by Mash and Barkley (1998). Assessment procedures were developed to identify specific strengths and weaknesses in auditory and visual processes hypothesized to be related to academic functioning, and this information was considered in the process known as “clinical teaching” (Mash and Barkley, 1998). In contrast to the Medical model, the psychoeducational approach advocated teaching academic skills as well as information-processing abilities, by taking into account the student modality preferences or areas of information-processing strength, the nature of the content to be learned, and the response required (Mash and Barkley, 1998).

▪ **The Behavioural or Task-Analytic Model**

According Lyon and Moats (1988), cited by Mash and Barkley (1998), behavioural approaches have conceptualised LDs as resulting from a mismatch between enabling behaviours and the characteristics of the

academic tasks. Assessment and instructional activities are directed towards evaluating academic skill deficits and modifying them with techniques derived from learning theory. The major assumption guiding this approach is that academic content consists of skills hierarchies, and the complex academic behaviours such as reading, writing, Mathematics can be task-analyzed into component sub skills.

Direct instruction is then applied to insure that all prerequisite sub skills are mastered and the target behaviours taught (Mash and Barkley, 1998). Reviews of the effectiveness of behavioural interventions with individuals with LDs have generally indicated favorable results with respect to increasing attentional and academic skills (Mash and Barkley, 1998). There has been some concern that academic skills acquired through the application of behavioural procedures do not generalize to contexts not incorporated in the training paradigm, and that some behavioural interventions are neither practical nor cost-effective (Myers & Hammill, 1990), cited by Mash and Barkley (1998).

▪ **Cognitive Models**

Cognitive models typically emphasize the processes involved in human thinking and are frequently referred to as “information-processing models” (Hallahan et al., 1996), cited by Mash and Barkley (1998). This model focuses on addressing specific information-processing abilities related to such domains as memory (e.g. rehearsal), thinking (e.g. metacognition) and more specific skills (e.g. the role of phonological awareness in the development of basic reading skills), (Mash and Barkley, 1998). Cognitive models are typically derived from cognitive and developmental psychology,

and their views of LDs suggest that instructions should be directed toward enabling students to exercise self-conscious, deliberate, and strategically applied efforts when learning academic content (Brown & Campione, 1986), cited by Mash and Barkley (1998).

According to Flavell, 1979; Hallahan et al., 1986, (cited by Mash & Barkley' 1998), with respect to teaching an individual with an LD problem-solving behaviours, assessment procedures are designed to determine whether the student can analyze the nature of the problem, relate the nature of the problem to previous experience, devise a strategic plan for operating on the information, and monitor and adjust performance. Instructional emphasis is then directed toward (1) increasing the learner's awareness of task demands, (2) teaching the student to employ appropriate strategies to facilitate task completion, and (3) teaching the student to monitor the success of the strategy (Lyon & Moats, 1988), cited by Mash and Barkley (1998).

▪ **Cognitive-Behavioural Model**

Cognitive-Behavioral models integrate the empirical principles of behavioural approach with the notion that affective states influence behaviour as well. This view includes mental activities in the active determination of behaviour (Mash & Barkley, 1998). Cognitive-behavioural models recognize the considerable influence of contingencies of reinforcement on learning (Hallahan et al., 1996) cited by Mash and Barkley (1998). According to Mash and Barkley (1998), "a critical concept in the development of cognitive-behavioural approaches to intervention is "reciprocal determinism"- that is, the idea that behaviour, environmental events, and internal variables such as thoughts and feelings interact with and

influence one another". Cognitive-behavioural interventions emphasize actively involving students in learning, particularly with respect to monitoring and directing their thinking and then measuring the outcomes of the intervention in an objective manner (Borkowski & Burk, 1996; Hallahan et al., 1996), cited by Mash and Barkley (1998).

A strong argument for utilizing cognitive behavioural approaches with individuals with LDs is that multicomponent, integrative interventions are necessary to address interrelated problems of an affective, behavioural, and cognitive nature. An excellent example of such an integrated model is "self-regulated strategy for development" (SRSD), which was designed to help students (1) master higher-level cognitive processes and strategies underlying effective performance on a variety of academic tasks; (2) develop autonomous, reflective, self-regulated use of this processes and strategies; and (3) form positive attitudes about themselves and their academic capabilities (Mash & Barkley, 1998). According to Graham and Harris (1996), (cited by Mash and Barkley, 1998), students learn specific strategies for successfully engaging in academic tasks, in conjunction with procedures for applying and regulating the use of these strategies in the tasks, and for modifying undesirable behaviour such as impulsivity that may interfere with performance.

▪ **Neuropsychological Model**

The underlying medical disorder in learning disabilities is a dysfunction of the central nervous system, which includes the brain. When the brain dysfunctions, it affects the neurobiology of the body. The neurobiology involves the interaction of the central nervous system with the immune

system and the endocrine system. Neuropsychological approaches to the instruction of individuals with LDs incorporate assessment and remediation concepts from both traditional medical and psychoeducational theories. Neuropsychological models are considered to be variants of medical models, in that they stress the role of neurobiology in learning (Mash & Barkley, 1998).

Neuropsychological model and theories of LDs conceptualize learning strengths and weaknesses as manifestations of efficient and inefficient brain regions or systems (Fisk & Rourke, 1983; Obrzut & Hynd, 1983; Rourke, 1991, 1995) cited by Mash and Barkley (1998). According to Mash and Barkley (1998), a number of researchers have extended theoretical concepts relevant to cerebral asymmetry and hemispheric specialization to explain both information-processing and response characteristics of children with LDs.

Others have hypothesized that LDs can result from a number of independent neurobehavioural deficiencies in information processing, thus underscoring the need to identify LD subtypes and subtype-specific interventions. Within these approaches, neuropsychological aptitudes such as simultaneous and sequential processing, linguistic processing and visual-spatial reasoning capacities are considered when direct instruction of academic skills is undertaken (Mash & Barkley, 1998). Mash and Barkley (1998) argued that the valid measurement of neuropsychological aptitudes for instruction is in an embryonic stage, making the prediction of various forms of treatment extremely difficult.

According to Lezak et.al (2004), structural problems of the brain, many times caused by the use of substances by the mother during gestation, can cause dysfunction of the brain after birth. When the foetus gets hit with a load of cocaine, whatever brain function was in development at that moment may be damaged. There are many substances and circumstances that can cause structural defects in a developing foetus's brain. Toxic substances can be very dangerous to brain function. Concern about lead depressing children's IQ led to the elimination of lead in gasoline and paint. Mercury and cadmium, pesticides and petrochemical-based products can have a devastating effect on brain function. Infections such as encephalitis, meningitis, pneumonia, severe influenza, measles, and other childhood diseases that overwhelm the individual's immune system make it difficult for the central nervous system to function properly.

Allergens also affect the function of the immune system and can adversely affect brain function. Molds, pollens, and animal dander's that are inhaled make it difficult to think. Food sensitivities causing such problems as "a leaky gut," fatigue and malaise, brain fatigue (inability to think well), stomach aches, leg aches and more, affect blood sugar function. The brain cannot function without adequate glucose or blood sugar. Brain trauma can be the result of many things. Specific head injury can impair thought even when the doctor finds no problem. Abuse and neglect can affect the brain directly or indirectly because of malnutrition. Abandonment and loss situations, such as the death of a parent, or a divorce in the family, can cause grief and the grief cycle. Feelings of anger and depression can look like learning disabilities but may clear when the time of grief has passed.

2.4. THE PSYCHOSOCIAL IMPACT OF LEARNING DISABILITIES: A DEVELOPMENTAL NEUROPSYCHOLOGICAL PERSPECTIVE

▪ Definitional issues for learning Disabilities (LD)

The term Learning Disabilities (LD) eventually emerged from a need to identify and serve a group of children who experience school failures but eluded the traditional categories of exceptionality (Finch & Kendall, 1979). Learning disabilities definitions primarily serve the purpose of classification of children, usually for educational purposes such as determining appropriate placement and program modifications. The clinical practitioner should be aware that some children with underlying neuropsychological deficiencies that result in learning problems may be excluded from classification (Kolb & Whishaw, 1996). The presence of a significant IQ-academic achievement discrepancy and the use of exclusionary criteria are two aspects of most LD definitions. These two criteria are problematic in a number of ways, including the following:

- ◆ Neuropsychological disorders that promote reading and other learning problems are not necessarily associated with significant IQ-academic achievement discrepancy.
- ◆ Even when a significant IQ-academic discrepancy is evident, it may take a number of years for it to emerge, thereby delaying unnecessarily diagnosis and intervention.
- ◆ Children who are assessed as having another identifiable problem (e.g. behavioural disorder or a primary sensory handicap) may not have their special learning needs identified.

In the latter situation, the child's behaviour disorder or sensory handicap may primary (or only) disorder present, with the child's central processing deficiencies and related learning problems either going unrecognized entirely or being thought as secondary to the behaviour disorder or sensory handicap (Kolb & Wishaw, 1996). As the field of neuropsychology continues to develop, it is most likely that there will be a further modification in the acceptance of what constitute a learning disability.

When considered from a developmental neuropsychological standpoint, it is clear that learning disabilities represent a heterogeneous group of congenital and or acquired central processing disorders (Leonard & Stout, 1994). They impair a person's ability to encode and or utilize information and experience relative to chronological age and cultural expectations. For the child, learning disabilities promote deficiencies in the development of capabilities that are typically evidenced in the academic and or social realm(s), while for the adult they can eventuate in limited academic skills and achievement, thereby diminishing vocational options and potentially limited interpersonal functioning (Kolb & Wishaw, 1996).

▪ **A Developmental Neuropsychological Perspective**

There are numerous biological and environmental factors that will influence to varying degrees and individual's level and pattern of neuropsychological capabilities. On the biological side, genetic, prenatal, perinatal, neurological disease and trauma represent prominent factors. Among other things, environmental considerations include demands, supports and direction that exist within the home' school and community settings. Because the nature

and impact of these factors will vary depending on the age of the individual, they need to be considered within the context of a developmental framework. Within the environmental sphere, children with specific higher order neuropsychological deficiencies may not be identified as having a learning problem until the grade four to five level, when the demands for organizational and generalization skills, self-directed learning, and other related skills increase substantially. Children naturally tend to gravitate towards interests and activities that exploit their neuropsychological strengths, especially when those strengths are outstanding relative to their neuropsychological weakness.

Since neuropsychological weaknesses are often central to observed learning or performance problems, conducting a neuropsychological assessment represents an appropriate beginning step in determining the degree to which this may be the case. In order to promote the optimal development of the child's neuropsychological potential, the child's special learning strengths and weaknesses need to be identified so that remedial, treatment and other forms of support can be specifically tailored to the child's short and longer term needs (Rourke et al, 1983), cited by Leornad and Stout (1994). In order to develop an adequate intervention strategy, the child's present and future environmental demands need to be identified, reasonable goals for the child need to be set, and ways to enhance his or her motivation and independence need to be found.

- **The neuropsychological Assessment of Learning Disabilities**

One of the purposes of this kind of assessment is to identify brain-behavioural deficiencies that contribute to the individual's learning and/or

behavioural problems. Another purpose is to identify areas of neuropsychological strengths that can be enlisted in remedial and rehabilitative approaches (Kolb and Whishaw, 1996). In order to accomplish these goals, the examination of the child needs to sample a fairly broad range of abilities. As a result, the neuropsychologist often includes a variety of measures of underlying capabilities that may be categorized as falling within the following ability related realms: sensory-perceptual, motor, psychomotor, receptive language, expressive language, memory, attention, visual-perceptual and visual spatial, verbal and non-verbal problem solving.

One or more academic screening measures may be included also in a complete neuropsychological assessment. In some instances the neuropsychological assessment will reveal ability profiles that are consistent with recognized subtypes of learning disabilities. Some patterns are considered to be consistent with neuropsychological syndromes, e.g. non-verbal learning disabilities (Rourke, 1989), cited by Kolb and Whishaw (1996). Most often, combinations of neuropsychological disorders are identified when assessing children or adults with behavioural or emotional adjustment problems who are referred for neuropsychological assessment (Kolb & Whishaw, 1996).

▪ **Neuropsychological Profiles and Adaptive Behavioural Interaction**

Adaptive behavioural domains usually relate to the individual's demonstrated communication, daily living, socialization and motor skills. Academic skills and emotional/behavioural adjustment may be conceptualized as other aspects of adaptive behavioural functioning. The indirect impact of the neuropsychological disorder may lead to lowered self-

esteem resulting from such conditions and circumstances as reduced opportunities for day-to-day success experiences increased criticisms and other forms of negative regard from caretakers and others, and in appropriate achievement expectations relative to the individual's neuropsychological capabilities. As such the degree to which neuropsychological disorders impact negatively on self-esteem will depend on the number of factors. These factors include parent's and other's understanding of the individual's adaptive behaviour as seen within the context of day-to-day demands and supports in home' school and community settings (Rourke, Fisk & Strang, 1986), cited by Kolb and Whishaw (1996).

There appear to be reasonable direct associations between the development and expression of age-appropriate adaptive behaviours and some types of neuropsychological disorders. This phenomenon is most apparent when two conditions are met: (a) a realm of neuropsychological functions is deficient (e.g. receptive language functions) and (b) the deficient neuropsychological realm underlies the development of readily identifiable adaptive behaviours (e.g. remembering instructions and other information that was heard).

Children who show neuropsychological deficiencies will most often show learning or performance problems in the academic situation. This is especially true for the child with a neuropsychological-based language disorder. There are many different types of language disorders, not all of which have neuropsychological substrate. Examples of clinical subtypes of neuropsychological language disorders include the following: language symbol processing disorder, receptive language disorder, and expressive language disorder (Kolb & Whishaw, 1996).

Children with a specific language symbol processing disorder show no significant weaknesses in the major neuropsychological realms. These children (and adults) exhibit specific dysfunction in the area of language symbol processing which includes letters, numbers, arithmetic signs and other forms of language symbols, especially those symbols that have no immediately associated concrete referent in everyday life. For example, a red hexagonal sign at the end of the road that has on it four white letters-STOP- therefore has a concrete, everyday life referent in our communities that serves to reinforce its meaning and identification. On the other hand, a multiplication sign (\times) has no obvious everyday concrete referent that reinforces its meaning (Barkley, 1997). Children with language symbols (that typically include problems with directionality of similar-appearing language symbols) are prone to misread multiplication sign (\times) as being a sign when having just previously completed one or more addition questions.

It has been noted that children with the most specific language symbol disorders tend to have outstanding problems on the Arithmetic, Digit span and Coding subsets of the WISC-111 (Wechsler, 1991, or earlier versions) (Kolb & Whishaw, 1996). Such children may be seen to show outstanding attentional difficulties when involved in reading, spelling, word copying, other types of tasks that include language symbol processing. Receptive language are often seen in conjunction with problem with sustained listening (particularly in group), auditory verbal memory difficulties, difficulties learning to read and spell, and a tendency to watch what others do rather than to listen for information when getting new instructions. Motivational, behavioural and/or attentional problems are often thought by parents and

teachers to underlie this type of child's problems' especially in the case of the pre-school or early school age child.

Expressive language disorders are found in association with notably underdeveloped word knowledge despite adequate opportunities for vocabulary (which may include a tendency to use very short sentences or to talk in circles without making clear one's point), and hesitancy or reluctance when verbal expression is required. Problems in written expression become more easily recognized in the older child and adolescence. Individuals with expressive language disorder may be seen as being shy, quiet, reluctant to express themselves, or even verbally withholding.

Expressive language disorders include a higher order information-processing component, including deficiencies in the areas of verbal abstract reasoning complex language-based ideas sequencing, verbal problem-solving and complex language mediated memory functions. This is one type of higher order neuropsychological disorder. Children with specific higher order neuropsychological deficiencies tend to grow into the adaptive behavioural (including educational) aspects of their learning problems. There is a typical adaptive behavioural presentation that is associated with non-verbal learning disabilities which includes a tendency towards an internalized emotional behavioural disposition, poor social skills and social reasoning, physical clumsiness and a tendency to avoid or exhibit poor performance in sports and general emotional egocentricity and immaturity.

There are versions of non-verbal learning disorders that do not include the full syndrome. For example, there is a subtype of children who through

congenital circumstances or brain injury, exhibits fairly specific and outstanding difficulties in non-verbal problem solving and associated reasoning situations. Such children tend to be quite talkative, usually disorganized in their approach to new situations or slow to adjust to change, and they tend to overemphasize specific aspects of social and other situations that require simultaneous reasoning as opposed to getting the whole picture. Such children may be diagnosed as having Attention Deficit/Hyperactivity Disorder (ADHD), Kolb and Whishaw (1996). The difference between this type of child's capabilities and those with others diagnosed with ADHD must be taken into account for best treatment results.

▪ **Learning Disabilities and Psychopathology**

Learning disabilities has been considered by some as a general source of vulnerability in the child (Esser, Schmidt, and Woerner, 1990), cited by Kolb and Whishaw (1996). Furthermore, children with LDs are no less susceptible to traumatic childhood events or their ill effects than children without LDs. In fact, there is reason to believe that at least some children with LDs may actually be more vulnerable to adverse events and conditions. Children grow up and develop within family and socio-cultural contexts, which unquestionably shape their behavioural and emotional functioning (Ray-Grant et al, 1992), cited by Kolb and Whishaw (1996). Risk and protective factors associated with the child and the environment in which he or she is raised and interacts have relevance for all children.

In general, the degree to which influences in the family, school and community environments are facilitative in light of the child's general and special developmental needs will strongly contribute to determining the

quality of the child's psychosocial outcome. As Horowitz (1982, 1987), (cited by Kolb & Whishaw, 1996), has pointed out, vulnerable children raised in a non-facilitative environment will be especially compromised in their developmental outcome. Learning disabled children reared in non-facilitative family environment would appear to be particularly at risk for developing mental health disorders (Esser et al, 1990), cited by Kolb and Whishaw (1996).

CHAPTER 3

METHODOLOGY

3.1. Research design

The research design that was used in the study was quantitative research design. Fifty children of whom 25 were diagnosed with Attention Deficit and Hyperactivity Disorders and 25 who were never diagnosed with Attention Deficit and Hyperactivity Disorders were tested by making use of the SSAIS-R IQ test and the Bender Visual Motor Gestalt test.

3.2. Sample

The sample of this study was primary school children who range between the ages of 6 to 13 years drawn from the general population in the school, which admit children with Attention Deficit and Hyperactivity Disorders, and Learning disorders. The school is a remedial school that falls under Gauteng Province, which only accepts children who have been diagnosed with Attention Deficit and Hyperactivity Disorders and learning disorders. This school is situated in Pretoria East and the research was conducted in the school. The sample consisted of both boys and girls, Caucasian and African who were diagnosed with Attention Deficit and Hyperactivity Disorders and/or Oppositional Defiant Disorders and Conduct Disorders. The control group also consists of both boys and girls from another school who were not diagnosed with Attention Deficit and Hyperactivity Disorder. Permission was granted from the Department of Education, the school and a letter was written to the parents asking for permission to conduct research on their

children. The total number of participants in the whole study was 50 (n=50). Random sampling will be used to collect data because some of the parents will never allow their children to participate in the study.

3.3. Measurement instrument

For the purpose of this study, Bender Visual Motor Gestalt Test will be used in order to measure if there are any signs of organicity; SSAIS-R will be used to measure IQ. Each child will be assessed on the above-mentioned psychometric tests, and the data will then be compared for differentiation purpose:

a) BENDER VISUAL MOTOR GESTALT TEST

■ Definition

The Bender Visual Motor Gestalt test (or Bender-Gestalt test) is a psychological assessment used to evaluate visual-motor functioning, visual-perceptual skills, neurological impairment, and emotional disturbances in children and adults ages three and older.

■ Purpose

The Bender-Gestalt is used to evaluate visual-motor maturity and to screen children for developmental delays. The test is also used to assess brain damage and neurological deficits. Individuals who have suffered a traumatic brain injury may be given the Bender-Gestalt as part of a battery of neuropsychological measures, or tests.

The Bender-Gestalt is sometimes used in conjunction with other personality tests to determine the presence of emotional and psychiatric disturbances such as schizophrenia.

• **Precautions**

Psychometric testing requires a clinically trained examiner. The Bender Visual Motor Gestalt Test should be administered and interpreted by a trained psychologist or psychiatrist. The Bender-Gestalt should always be employed as only one element of a complete battery of psychological or developmental tests, and should never be used alone as the sole basis for a diagnosis.

• **Description**

The original Bender Visual Motor Gestalt test was developed in 1938 by psychiatrist Lauretta Bender. There are several different versions of the Bender-Gestalt available today (i.e., the Bender-Gestalt test; Modified Version of the Bender-Gestalt test for Preschool and Primary School Children; the Hutt Adaptation of the Bender-Gestalt test; the Bender Visual Motor Gestalt test for Children; the Bender-Gestalt test for Young Children; the Watkins Bender-Gestalt Scoring System; the Canter Background Interference Procedure for the Bender-Gestalt test). All use the same basic test materials, but vary in their scoring and interpretation methods.

The standard Bender Visual Motor Gestalt test consists of nine figures, each on its own 3 X 5 card. An examiner presents each figure to the test subject one at a time and asks the subject to copy it onto a single piece of blank paper. The only instruction given to the subject is that he or she should make

the best reproduction of the figure possible. The test is not timed, although standard administration time is typically 10-20 minutes. After testing is complete, the results are scored based on accuracy and organization. Interpretation depends on the form of the test in use. Common features considered in evaluating the drawings are rotation, distortion, symmetry, and perseveration. As an example, a patient with frontal lobe injury may reproduce the same pattern over and over (perseveration)

The Bender-Gestalt can also be administered in a group setting. In group testing, the figures are shown to test subjects with a slide projector, in a test booklet, or on larger versions of the individual test cards. Both the individual and group-administered Bender-Gestalt evaluation may take place in either an outpatient or hospital setting. Patients should check with their insurance plans to determine if these or other mental health services are covered.

▪ **Normal results**

Children normally improve in this test as they age, but, because of the complexity of the scoring process, results for the Bender-Gestalt should only be interpreted by a clinically trained psychologist or psychiatrist.

▪ **Key Terms:**

Neuropsychological test

A test or assessment given to diagnose a brain disorder or disease.

Perservation

The persistence of a repetitive response after the cause of the response has been removed, or the response continues to different stimuli.

Visual-motor skills

Hand-eye coordination; in the Bender-Gestalt test, visual-motor skills are measured by the subject's ability to accurately perceive and then reproduce figures.

Visual-perceptual skills

The capacity of the mind and the eye to "see" something as it objectively exists.

b) THE SENIOR SOUTH AFRICAN INDIVIDUAL SCALE-REVISED

▪ **Theoretical background**

The Senior South African Individual Scale-Revised (SSAIS-R) is a revised version of the SSAIS released in 1964. The New South African Individual Scale (NSAIS) was released in 1964 and has been known since 1980 as the Senior South African Individual Scale (SSAIS). The scale is an intelligence test and was standardized for Afrikaans-speaking and English-speaking pupils between the ages of five years 0 months and 17 years 11 months. The

SSAIS-R has been standardized for South African pupils between the ages of seven years 0 month and 16 years 11 months.

- **Aim**

The purpose of the study was to determine whether differences exist between children with and without ADHD and measures of IQ, Organicity and Emotional Problems. The SSAIS-R is used to obtain a differential picture of certain cognitive abilities. Firstly the level of general intelligence is determined, for instance to predict scholastic achievement. Secondly relative strengths and weaknesses in certain important facets of intelligence are evaluated to obtain diagnostic and prognostic information.

- **Rationale**

The tests of the SSAIS-R cover a wide field and involve a variety of aspects of behaviour that are representative of intelligence. The total score of the tests of intelligence scale represents the broader, underlying factor of general intelligence. This factor represents intellectual ability that continuously develops under specific environmental influences.

The two primary mental abilities measured by the tests of the SSAIS-R are a verbal and a non-verbal factor. These factors are related to different mental processes and different test contents. The rationale for each test indicates how these processes are involved and how certain test contents are used to measure them.

▪ **Description and aim of, and rationale for each test**

Test 1: Vocabulary

Description

The test consists of five cards with four pictures on each card. The testee is asked to indicate the picture, which is most relevant to a given word. There are ten stimulus words for each card, making a total of 50 words.

Aim

This test measures a person's verbal intelligence and verbal learning ability. The score obtained on this test also indicates a person's language development and language usage. Long-term memory and concept formation play a role in these abilities.

Rationale

The test is based on the assumption that the quality and extent of a person's vocabulary is a good measurement of his general intelligence.

A person's vocabulary reflects the scope of his ideas. The educational environment, especially early in life, plays a crucial role in vocabulary formation.

Test 2: Comprehension

Description

The testee is asked 15 questions, which are relevant to situations, and practices in everyday life. Scoring is based on the qualitative differentiation between the testee's responses.

Aim

The test items include a variety of social situations. The degree of comprehension that the testee shows for these situations represents his intellectual functioning. Knowledge of conventional standards of behavior is necessary for success in the test, and the ability to understand and use this information in a meaningful and emotionally relevant way is evaluated.

Rationale

The test is based on the assumption that social adaptation and social judgement are inculcated through everyday experiences and formal training. The ability to reason logically is needed to evaluate the information gained through these experiences as well as to apply this information to other situations in a socially acceptable way.

Test 3: Similarities

Description

The test consists of 15 items in each of which the testee is required to indicate the similarities between two concepts. Correct responses are evaluated on the basis of the classification of levels of reasoning, namely abstracts, functional and concrete.

Aim

Logical, abstract reasoning, verbal concept formation and long-term memory play a role in performance on this test. A rule has to be deduced from specific facts in order to make a classification. The ability to distinguish between essential and superficial similarities is therefore important.

Rationale

The test is based on the assumption that the ability to discern the similarities between dissimilar objects and situations and to form concepts on the basis of the similarities is an important facet of general intelligence.

The ability to form associations and to classify develops through exposure to objects, ideas and information in a person's educational environment.

Test 4: Number Problems

Description

The test consists of 20 verbally formulated arithmetical problems. 11 of the items are presented only verbally, whereas the other nine items are also presented on cards.

Aim

The test measures numerical reasoning with the underlying logical reasoning, abstract thought and mental alertness. Productive concentration is also important to succeed in this test.

Rationale

The test is based on the assumption that the ability to solve number problems is an indication of general intelligence.

The basic mathematical computations, namely addition, subtraction, multiplication and division, are learned through practical experience and in formal education.

Test 5: Story Memory

Description

The test consists of a short story that the tester reads to the testee. Then the testee is asked to repeat whatever he can remember about the story. There are 43 facts/items in the story.

Aim

The test measures short-term auditory memory. Meaningful verbal learning matter is used to measure the testee's ability to pay attention in a relatively simple situation.

Rationale

The test is based on the assumption that logical memory (the ability to repeat, not necessarily verbatim, essential content/ meaning) is one of the abilities of which a certain minimum is required at every level of intellectual functioning. The test is probably a good measure of general intelligence, especially at the lower levels of intelligence, and may also have diagnostic value.

Test 6: Pattern Completion

Description

Partially completed patterns have to be completed. Each item consists of three figures from which the testee has to deduce a pattern in order to draw the fourth figure. Free responses are required of the testee. The test consists of four practice examples which are taken into account in the scoring, and a further 15 items.

Aim

The test is a non-verbal measure of the processes underlying logical thinking. Accurate visual perception, concrete reasoning with the help of figures, concept formation and concentration are important to succeed in this test. The mental manipulation of the pattern parts comprises mainly synthesis in the easier items, whereas the more difficult items possibly also require verbalizing the observed relation.

Rationale

The test is based on the assumption that reasoning by means of analogies is an indication of general intelligence.

Test 7: Block Design

Description

Plastic cubes are used to copy patterns from an example. A model is presented for Item one and two design cards are used for the other items. The test consists of 15 items of which the first three are also used as practice examples. Four cubes/ blocks are used for the first seven items and nine blocks for the remaining items.

Aim

The test measures non-verbal intelligence and non-verbal problem-solving skills. The testee has to solve problems in spatial relations by using logical reasoning. Shapes have to be observed and analyzed by reducing a whole (design) into its component parts and then reassembling them in an identical design.

Rationale

The test is based on the assumption that the ability to analyze, synthesize and copy an abstract two-dimensional geometric pattern is a valid criterion of general intelligence.

Test 8: Missing Parts

Description

The test consists of 20 pictures. Each of the pictures has an essential part missing. The testee is asked to indicate, verbally or just by pointing, what is missing from the picture. The first two items are used as practice examples.

Aim

The test measures contact reality, knowledge and comprehension of familiar situations, the ability to distinguish between essential and non-essential visual information and the ability to see the whole in relation to its parts. Visual concentration and organization is important and visual memory and verbal comprehension also plays a role in performance on this test. Perceptual and conceptual abilities are measured, since these abilities are involved in visual recognizing, identifying and understanding familiar objects and situations.

Rationale

The test is based on the assumption that the visual comprehension and detailed perception of familiar objects and situations are an indication of general intelligence.

Test 9: Form Board

Description

The test consists of a board with six figures, each of which is constructed out of three or four loose parts with a distinguishing colour of each figure. The parts are placed in predetermined positions in the lid before the testee begins the test.

Aim

The test measures visual perception, visual organization, visual concept formation and the ability to see the underlying relations between objects. Visual-motor co-ordination, where the motor activity is directed by visual perception and sensory-motor feedback, is also important.

Rationale

The test is based on the assumption that the synthesis of parts-concrete, visual shapes-into an organized, integrated whole constitutes a valid criterion of general intelligence. Although the g loading is not very high, the test does make qualitative evaluation of the testee's cognitive style possible.

Test 10: Memory for Digits

Description

The test consists of two sections, namely Digits Forward and Digits Backward. The tester reads out a series of digits, which the testee has to repeat verbatim in the same sequence in the first section of the test, and in reversed sequence in the second section of the test. The first section has eight items with two digit series in each item. The second section has two

practice examples that are not taken into account for scoring purposes, followed by seven items with two digit series in each item.

Aim

The test measures auditory short-term memory for numbers, but performance on this test is not necessarily an indication of memory for more complex information. The testee has to receive information correctly, and recall order and vocalize it correctly. Attention and concentration are therefore also measured.

The repletion of digit series in their usual sequence requires mainly mechanical memory whereas the repetition of such series in reversed sequence requires more complex abilities. In the latter case the testee has to store the information longer and transform the stimulus material before recalling it. Mental control is important here.

Rationale

The test is based on the assumption that memory, specifically mechanical memory here, is one of the abilities of which a certain minimum is required at every level of intellectual functioning. The test also has diagnostic value.

Test 11: Coding

Description

Digits from one to nine, each with an accompanying symbol, are given in a key. Each item of the test comprises a digit and the testee has to write down the accompanying symbol for that digit. The test consists of seven practice examples, which are not taken into account for scoring purposes, followed by 91 items.

Aim

The testee has to learn an unfamiliar task and implement what has been learnt. The test measures visual-associative learning ability, psychomotor speed and visual-motor integration and co-ordination. Attention, concentration, motivation and short-term memory also play a role in performance on this test.

Rationale

The test is based on the assumption that the associative learning ability, which is required to learn and use the relation between specific symbols and digits, is an indication of general intelligence.

3.4. Data sampling

Permission was gained from schools and parents to test these children with the mentioned psychometric instruments. The tests were completed and the results of the Bender Visual Gestalt test were classified to simply indicate whether signs of organicity were present or not. This was done in order to facilitate statistical analysis due to the qualitative nature of the data.

3.5. Data analysis

The data was captured onto SPSS in order to do the analysis. The data analysis had the following aims:

- To determine whether significant differences existed between the two groups on all subtests measured on the SSAIS-R as well as the total verbal and non-verbal IQ scores and the total IQ score.

- To determine whether significant relationships existed between the presence of ADHD and indications of organicity.

Since the sample was relatively small and consisted of only 25 respondents per group respectively, use was made of non-parametric statistics to analyse the data. Non-parametric tests, also known as distribution-free tests, are a class of tests that does not rely on a parameter estimation and/or distribution assumptions (Howell, 1992). The major advantage attributed to these tests is that they do not rely on any seriously restrictive assumptions concerning the shape of the sampled populations and thus accommodates small samples as in the case of this study.

3.6. Statistical analysis

The following statistical data analysis procedures were used:

- a) **Descriptive statistics.** Descriptive statistics are primarily aimed at describing the data. Frequencies will be used to give a description of the sample. Means will be used to describe the respective groups' performance on IQ test. The mean is generally what is meant by the word average. The mean is the total of the scores divided by the number of scores (Howell, 1992). Certain disadvantages are associated with the mean. It is influenced by extreme scores, its value may not actually exist in the data, and its interpretation in terms of the underlying variable being measured requires at least some faith in the interval properties of the data (Howell, 1992: p.33). The mean, standard deviation, minimum and maximum scores for each measurement per group were determined for reference purposes.

The following statistical data analysis procedures were used:

a. **Descriptive statistics.** Descriptive statistics are primarily aimed at describing the data. The mean, standard deviation, minimum and maximum scores for each measurement per group were determined for reference purposes.

b. **Inferential statistics:** Test hypotheses about differences in populations on the basis of measurements made on samples of subjects (Tabachnick & Fidell, 1996: p.9).

(1) **The Mann-Whitney Test:** The Mann-Whitney test is used for testing differences between means when there are two conditions and different subjects have been used in each condition (Field, 2000: p.49). This test is a distribution-free alternative to the independent samples t-test. Like the t-test, Mann-Whitney tests the null hypothesis that two independent samples (groups) come from the same population (not just populations with the same mean). Rather than being based on parameters of a normal distribution like mean and variance, Mann-Whitney statistics are based on ranks. The Mann-Whitney statistic is obtained by counting the number of times an observation from the group with the smaller sample size precedes an observation from the larger group. It is especially sensitive to population differences in central tendency (Howell, 1992: p.611). The rejection of the null hypothesis is generally interpreted to mean that the two distributions had different central tendencies. This test was used to determine significant differences between

the experimental (ADHD) and control (No indication of ADHD) groups on all variables measured.

(3) **Chi-square:** This test is used when we have two variables and want to determine whether these variables are independent of one another. The data are cast in what is commonly referred to as a contingency table (Howell, 1992). This technique thus gives an indication of whether there is a statistically significant relationship between two variables. The coefficient does however, not give an indication of the strength or direction of the relationship. This technique was used to determine whether there were statistically significant relationships between the presence of ADHD and organicity and emotional problems.

3.7. Ethical considerations

- **Informed consent**

The informed consent form is will be given to the parents of each subject prior to participation in the project. It describes the purpose of the study and states what the subject will be asked to do. Any known risks or benefits related to the study are made clear to the subject and the parents (Bless and Higson-Smith, 1995).

- **Deception**

The researcher will be honest to the parents and the participants. All the information given to the parents will true. Before they agree to participate, the researcher will explain to the participants in straightforward and clear terms what is involved. This includes explaining that they may withdraw

from the study at any point without losing out in any material way (Bless and Higson-Smith, 1995).

- **Confidentiality**

What the researcher learns about individual participants in the course of the study is confidential. Their data will be reported anonymously, and often will be aggregated with the data from other participants in the same group. The information about individual participants will not be discussed with anyone (Bless and Higson-Smith, 1995).

CHAPTER 4

RESULTS

The results will be presented in the following order:

- a. Descriptive statistics for the two groups on all measurements
- b. Results of the analysis of the comparison of the two groups on various measurements.
- c. Results of the analysis of chi-square tests to test for relationships between the presence of ADHD and organcity and emotional problems.

DESCRIPTIVE STATISTICS FOR THE TWO GROUPS ON ALL MEASUREMENTS

These results are included simply as frame of reference for the reader to see how the two groups performed on all the measurements. The results are presented in Table 1.

Table 1: Descriptive statistics of various measurements for the experimental and control group

Group	Test	N	Minimum	Maximum	Mean	Std. Deviation
Experimental	Test 1: Vocabulary	25	11	20	17.16	2.809
	Test 2: Comprehension	25	2	12	7.12	2.651
	Test 3: Similarities	25	6	15	9.60	2.345
	Test 4: Number Problems	25	4	16	8.60	3.109
	Test 5: Story memory	25	1	14	6.08	3.135
	Test 6: Verbal tests	25	31	65	48.56	9.946
	Test 6: Pattern completion	25	5	20	11.76	4.790
	Test 7: Block designs	25	1	19	9.28	4.954
	Test 8: Matching matrix	25	5	16	9.16	3.118
	Test 9: Torm Board	25	3	20	8.88	4.196
	Total of Verbal tests	25	16	68	39.08	14.041
	Verbal Scale	25	75	120	98.92	13.422
	Non-verbal Scale	25	58	149	98.40	23.838
	Full Scale	25	68	132	98.32	17.745
Control	Test 1: Vocabulary	25	13	20	19.52	1.686
	Test 2: Comprehension	25	6	17	11.72	3.182
	Test 3: Similarities	25	10	20	15.80	3.041
	Test 4: Number Problems	25	9	20	14.64	2.691
	Test 5: Story memory	25	5	20	10.84	2.703
	Test 6: Verbal tests	25	54	92	73.00	8.276
	Test 6: Pattern completion	25	5	20	13.04	4.228
	Test 7: Block designs	25	8	18	11.88	2.223
	Test 8: Matching matrix	25	7	20	15.80	3.753
	Test 9: Torm Board	25	6	15	12.04	2.336
	Total of non-verbal tests	25	39	69	52.36	9.473
	Verbal Scale	25	107	149	129.56	9.648
	Non-verbal Scale	25	99	149	120.68	16.033
	Full Scale	25	107	149	128.88	11.237
Valid N (listwise)	25					

RESULTS OF THE ANALYSIS OF THE COMPARISON OF THE TWO GROUPS ON VARIOUS MEASUREMENTS

As indicated previously, Mann-Whitney U-tests were used to determine whether statistically significant differences existed between the two groups on various variables measured. The mean scores will be shown in all figures. Only statistically significant differences on the 5% level of significance will be graphically presented. *It is important to note that statistically significant*

differences in scores do not necessarily reflect clinical differences. The results of these analyses are presented in figures 1 to 3.

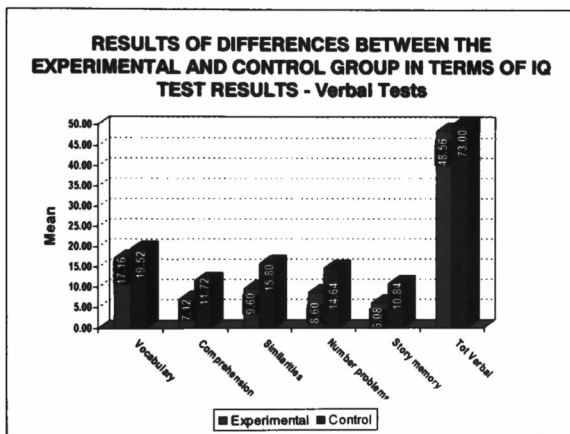


Figure 1

Table 2: Results of Mann-Whitney tests on Verbal IQ tests

	Test 1: Vocabulary	Test 2: Comprehension	Test 3: Similarities	Test 4: Number Problems	Test 5: Story memory	Total of Verbal tests
Mann-Whitney U	133.500	83.500	37.500	50.000	78.500	15.500
Wilcoxon Signed Rank	458.500	408.500	362.500	375.000	401.500	340.500
Z	-3.983	-4.488	-5.355	-5.110	-4.614	-5.769
Asymp. Sig. (2-tailed)	.000	.000	.000	.000	.000	.000

a. Grouping Variable: Group

Results in figure 1 and Table 2 can be interpreted as follows:

All the subtests of the Verbal Tests on the SSAIS-R as well as the total Verbal Test score showed statistically significant differences between the experimental and control group at the 5% level of significance. In all cases

the experimental group's scores were significantly lower than the control groups. Children with ADHD thus performed significantly lower on the Verbal subtests than children without ADHD.

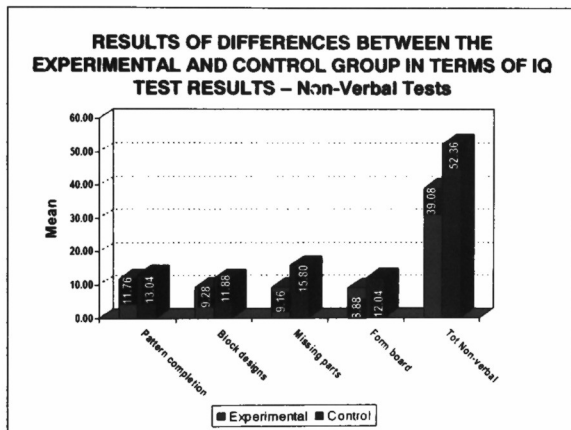


Figure 2

Table 3: Results of Mann-Whitney tests on Non-Verbal IQ tests

	Test 6: Pattern completion	Test 7: Block designs	Test 8: Missing parts	Test 9: Form Board	Total of non-verbal tests
Mann-Whitney U	250.000	175.500	61.500	139.500	129.000
Wilcoxon W	575.000	500.500	386.500	464.500	454.000
Z	-1.219	-2.675	-4.892	-3.375	-3.566
Asymp. Sig. (2-tailed)	.223	.007	.000	.001	.000

a. Grouping Variable: Group

The results in figure two and Table three indicate that statistically significant differences were found between the two groups on all non-verbal sub-tests except for Pattern completion. These differences were significant at the 5% level of significance. In all cases the experimental group's scores were

significantly lower than the control groups. Children with ADHD thus performed significantly lower on these non-verbal tests than children without ADHD. However, there were no significant differences between the performances of the two groups of children in terms of Pattern completion.

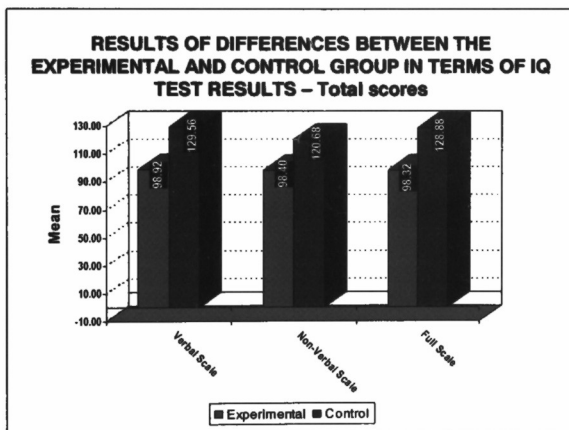


Figure 3

Table 4: Results of Mann-Whitney tests on totals of Verbal, Non-Verbal and Total IQ tests

	Verbal Scale	Non-verbal Scale	Full Scale
Mann-Whitney U	15.500	129.500	50.000
Wilcoxon W	340.500	454.500	375.000
Z	-5.769	-3.557	-5.096
Asymp. Sig. (2-tailed)	.000	.000	.000

As can be expected from the prior results, statistically significant differences were found between the two groups on all the total IQ scores. In all cases

the experimental group's scores were significantly lower than the control group. Children with ADHD thus performed significantly lower on these tests.

RESULTS OF THE ANALYSIS OF CHI-SQUARE TESTS TO TEST FOR RELATIONSHIPS BETWEEN THE PRESENCE OF ADHD AND ORGANICITY

As indicated earlier, Chi-square tests were used to determine whether there were any relationships between the presence of ADHD and signs of organicity. All remarks written down by the researcher were scrutinized to determine whether there were any signs of organicity or emotional problems and the profiles were then classified as normal or abnormal depending on whether any of the remarks referred to the presence of these aspects or not.

The results of these analyses are presented in Tables 5 and 6.

Table 5: Results of Chi-square analysis between presence of ADHD and signs of Organicity

		Organicity		Total	
		Normal	Abnormal		
Group	Experimental	Count	22	3	25
		% within Group	88.0%	12.0%	100.0%
		% within Organicity	46.8%	100.0%	50.0%
	Control	Count	25	0	25
		% within Group	100.0%	.0%	100.0%
		% within Organicity	53.2%	.0%	50.0%
Total	Count		47	3	50
		% within Group	94.0%	6.0%	100.0%
		% within Organicity	100.0%	100.0%	100.0%

Table 5 (Continued): Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.191(b)	1	.074		
Continuity Correction(a)	1.418	1	.234		
Likelihood Ratio	4.351	1	.037		
Fisher's Exact Test				.235	.117
Linear-by-Linear Association	3.128	1	.077		
N of Valid Cases	50				

a. Computed only for a 2x2 table

The results in table 5 indicate that there is a significant relationship between the presence of ADHD and signs of organicity. However, this relationship is only significant at the 5% level of significance and it should be noted that only three of the children with ADHD showed signs of organicity.

SUMMARY OF RESULTS

The results indicate that there were statistical significant differences between children with ADHD and those without on both verbal and non-verbal IQ tests. This was the case for all but Pattern completion where no significant difference occurred.

Results of chi-square tests indicated that there is a relationship between the presence of ADHD and signs of organicity. Three of the children with ADHD showed signs of organicity compared to none in the control group.

CHAPTER 5

DISCUSSION AND CONCLUSION

It was expected from the results that children diagnosed with ADHD would perform differently than the control group on the assessment of intelligence, and organicity. The results were designed to specifically highlight the particular subtests and subscales that are indicative of ADHD symptomatology. Any significant differences between the control group and ADHD group would be an important discovery. Although, differences were expected, it was essential to verify where they occurred and how significant these differences were.

In Chapter 1, the following hypotheses were formulated:

- ◆ ADHD children are different from normal children on measures of IQ and intelligence level.

This hypothesis is accepted, as there is a significant difference between children with ADHD and the control group. The total IQ scores of children with ADHD are significantly lower than those without ADHD. Children with ADHD performed lower in all aspects of the verbal and nonverbal subtests than children without ADHD, namely:

- Vocabulary - which is intended to measure recognition, comprehension, identification and interpretation of words.

the meaningful manipulation of numbers is mental alertness and concentration.

A significantly low score may be due to a high anxiety level which prevented the child from concentrating on the task, poor auditory memory for details, and impairment of higher cognitive functions often characteristic of the minimal brain dysfunction syndrome.

- **Story Memory** - measures immediate auditory recall or immediate auditory attention span.

A significantly low score may be due to a hearing defect, a high level of anxiety or tension, and an organic condition, which interferes with the child's ability to attend to or concentrate on the task at hand.

- **Pattern Completion** - measures the ability to analyse and extract concepts and to apply them.

A significantly low score may be due to an inability or impaired ability to concentrate, a high anxiety level, an inability to manipulate spatial concepts, and a tendency to perfectionism.

- **Block Design** - measures visual perception and organization, spatial relations, visual analysis, and synthesis of patterns and logical reasoning skills.

A significantly low score may be due to high anxiety and insecurity, perceptual problems and poor spatial conceptualization, deficiencies in visual reasoning skills which may have an organic basis, rigidity or inflexibility in thinking patterns, lack of reflectivity, and a low level of aspiration (failure orientation).

- **Missing Parts** - measures the ability to judge the correctness of units of figural information. It requires visual memory and visual discrimination ability.

A significantly low score may be due to poor attention and concentration due to anxiety, inadequate basic perceptual ability or visual discrimination, poor reality testing or emotional problems, and susceptibility to being led astray by unessential or irrelevant details.

- **Formboard** - measures the ability to see the relationships of parts to a whole. It also reflects the adequacy of the testee's visual perception, perceptual organization and visual-motor skills.

A significantly low score may be due to poor spatial ability which may be due to sensory or motor impairment, little interest in practical tasks, high anxiety, and rigid thought processes.

◆ ADHD children have some form of neurological deficit or organicity

This hypothesis is accepted since there was a significant relationship between the presence of ADHD and signs of organicity. Only three children showed signs of organicity. According to Groth-Marnat (1990) for organicity, four or more of the following characteristics must be present:

- Simplification of two or more figures to a level three or more years below the child's chronological age
- Collision of a figure with another figure or a reproduction in which a figure runs off the edge of the paper
- Fragmentation of one or more figures
- Rotation of one or more figure 90 degrees or more
- Incorrect number of units in three or more figures
- Perseveration from figure to figure of one type or unit
- Tremelous line quality
- Lines instead of dots
- Drawing a straight line when a curve one is indicated.

Conclusion

It is apparent that the ADHD group was of lower intelligence than the control group. This is likely due to ADHD symptoms interfering with SSAIS-R performance outcome. This might not hold true because of the limitation of the sample (sample was 50). This result was congruent with initial hopes and expectations, setting a strong foundation for further study.

Most noted, was the significant difference between the ADHD and control group on Full IQ Scale. This was a catalyst in furthering the research to a new real. The question here then arouse as to whether the differences may have been due to IQ, or was the ADHD group distracted enough to perform significantly worse on reading, spelling, mathematics, comprehension and written tasks. These tasks are important as they also parallel typical school academic tasks, and correlated with behavior ratings, could show a potential degree of association. Possibly, if manipulated effectively, IQ may resurface as the primary method for differential diagnosis.

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Number and type of schools:	1 Primary School
District/s/HO	Tshwane North

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

Permission has been granted to proceed with the above study subject to the conditions listed below being met, and may be withdrawn should any of these conditions be flouted:

1. *The District/Head Office Senior Manager/s concerned must be presented with a copy of this letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.*
2. *The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.*
3. *A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.*

4. A letter / document that outlines the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.
5. The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, chairpersons of the SGBs, teachers and learners involved. Persons who offer their co-operation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.
6. Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal (if at a school) and/or Senior Manager (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.
7. Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year.
8. Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.
9. It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.
10. The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.
11. The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.
12. On completion of the study the researcher must supply the Senior Manager: Strategic Policy Development, Management & Research Coordination with one Hard Cover bound and one Ring bound copy of the final, approved research report. The researcher would also provide the said manager with an electronic copy of the research abstract/summary and/or annotation.
13. The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned.
14. Should the researcher have been involved with research at a school and/or a district/head office level, the Senior Manager concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards



ALBERT CHANEE
ACTING DIVISIONAL MANAGER: OFSTED

The contents of this letter has been read and understood by the researcher.

Signature of Researcher:

Date:

ANSWER BOOKLET

SARS

ANTWOORDBOEKIE

Name/Naam: _____

Surname/Van: _____

School/Skool: _____

Date of testing/Toetsdatum: _____ Date of birth/Geboortedatum: _____

Age (years and completed months)/Ouderdom (jare en voltooide maande): _____

Sex/Geslag: _____ Standard/Standerd: _____

Language/Taal _____

education/onderrig: _____ home/huis: _____ testing/toetsing: _____

Parents' surname/Ouers se van: _____

Home address/Huisadres: _____

Father's occupation/Vader se beroep: _____

Mother's occupation/Moeder se beroep: _____

Domestic circumstances/Huislike omstandighede: _____

Other tests (specify)/Ander toetse (spesifiseer): _____

Referred by/Verwys deur: _____

Reason for referral/Rede vir verwysing: _____

Tester/Toetsafnemer: _____

Comments/Opmerkings: _____



TESTS IN COMPOSITE SCALES TOETSE IN SAAMGESTELDE SKALE	Test score Toetstelling	
VERBAL TESTS/VERBALE TOETSE	Raw score Rouppunt	Scaled score Skaalpunt
Test 1: Vocabulary/Toets 1: Woordeskat		
Test 2: Comprehension/Toets 2: Begrip		
Test 3: Similarities/Toets 3: Coreenkomste		
Test 4: Number Problems/Toets 4: Getalprobleme		
Test 5: Story Memory/Toets 5: Storiegeheue		
Total of verbal tests/Totaal van verbale toetse		
NON-VERBAL TESTS/NIE-VERBALE TOETSE	Raw score Rouppunt	Scaled score Skaalpunt
Test 6: Pattern Completion/Toets 6: Patroonvoltooiing		
Test 7: Block Designs/Toets 7: Blokpatrone		
Test 8: Missing Parts/Toets 8: Ontbrekende Dele		
Test 9: Form Board/Toets 9: Vormbord		
Total of non-verbal tests/Totaal van nie-verbale toetse		
COMPOSITE SCALES/SAAMGESTELDE SKALE	Scaled score total Skaalpunttotaal	IQ IK
Verbal Scale/Verbale Skaal		
Non-verbal Scale/ Nie-verbale Skaal		
Full Scale/Volle Skaal		

ADDITIONAL TESTS/ADDISIONELE TOETSE	Raw score Rouppunt	Scaled score Skaalpunt
Test 10: Memory for Digits/Toets 10: Syfergeheue		
Test 11: Coding/Toets 11: Kodering		

Tables of norms used/Normtabelle gebruik: _____
 Refer to Part I of the manual to determine whether the following information is applicable as well as for the interpretation of the information./Verwys na Deel I van die handleiding om te bepaal of die volgende inligting toepaslik is, asook vir die interpretasie van die inligting.

Depression index/SED-inoeks: _____

1 probably indicates environmental deprivation./1 dui waarskynlik op milieugestremtheid)

SCATTER ANALYSIS/STROOINGSONTLEDING

Test/Toets	Scaled score Skaalpunt	Deviation Afwyking	Significant deviation Betekenisvolle afwyking	
			5 %-peil 5 % level	1 %-peil 1 % level

VERBAL SCALE/VERBALE SKAAL

Test 1: Vocabulary/Toets 1: Woordeskat				
Test 2: Comprehension/Toets 2: Begrip				
Test 3: Similarities/Toets 3: Ooreenkomste				
Test 4: Number Problems/Toets 4: Getalprobleme				
Test 5: Story Memory/Toets 5: Storiegeheue				
Sum of scaled scores/Som van skaalpunkte				
Average/Gemiddelde				
Test 10: Memory for Digits/Toets 10: Syfergeheue				

NON-VERBAL SCALE/NIE-VERBALE SKAAL

Test 6: Pattern Completion/Toets 6: Patroonvoltooiing				
Test 7: Block Designs/Toets 7: Blokpatrone				
Test 8: Missing Parts/Toets 8: Ontbrekende Dele				
Test 9: Form Board/Toets 9: Vormbord				
Sum of scaled scores/Som van skaalpunkte				
Average/Gemiddelde				
Test 11: Coding/Toets 11: Kodering				

FULL SCALE/VOLLE SKAAL

Test 1: Vocabulary/Toets 1: Woordeskat				
Test 2: Comprehension/Toets 2: Begrip				
Test 3: Similarities/Toets 3: Ooreenkomste				
Test 4: Number Problems/Toets 4: Getalprobleme				
Test 5: Story Memory/Toets 5: Storiegeheue				
Test 6: Pattern Completion/Toets 6: Patroonvoltooiing				
Test 7: Block Designs/Toets 7: Blokpatrone				
Test 8: Missing Parts/Toets 8: Ontbrekende Dele				
Test 9: Form Board/Toets 9: Vormbord				
Sum of scaled scores/Som van skaalpunkte				
Average/Gemiddelde				
Test 10: Memory for Digits/Toets 10: Syfergeheue				
Test 11: Coding/Toets 11: Kodering				

TEST 1: VOCABULARY/TOETS 1: WOORDESKAT

DISCONTINUATION RULE FOR 7- to 10-YEAR-OLD TESTEES

DISCONTINUE A CARD after 6 consecutive failures (zero scores) and present the next card.

STAAKREËL VIR 7- TOT 10-JARIGE TOETSLINGE

STAAK 'N KAART na 6 agtereenvolgende mislukkings (nuttellings) en lê die volgende kaart voor.

Item	Answer	Item	Antwoord	Response Respons	Score Telling
Card 1		Kaart 1			
1. crime	C	1. roof	C		
2. surgical	A	2. pasiënt	A		
3. refreshments	B	3. geselligheid	B		
4. stethoscope	A	4. misdaad	C		
5. anaesthesia	A	5. teenstander	D		
6. symptoms	A	6. stetoskoop	A		
7. prescription	A	7. simptome	A		
8. stamina	D	8. versnaperinge	B		
9. intimidate	C	9. wedywar	D		
10. conviviality	B	10. intimideer	C		
Card 2		Kaart 2			
1. bus	A	1. bus	A		
2. government	B	2. parlement	B		
3. platform	C	3. kompartement	C		
4. manufacture	D	4. platform	C		
5. refinery	D	5. produktiwiteit	D		
6. election	B	6. landsbestuur	B		
7. productivity	D	7. inhuldiging	B		
8. landscape	A	8. eieksie	B		
9. inauguration	B	9. landskap	A		
10. panorama	A	10. panorama	A		
Card 3		Kaart 3			
1. shopping	B	1. inkopies	B		
2. magazine	C	2. eensaam	D		
3. horizon	D	3. hoflik	A		
4. budget	B	4. gesigseinder	D		
5. sweltering	D	5. publikasie	C		

6. elegant	A	6. wanhoop	D		
7. isolation	D	7. huishoudelik	B		
8. desolation	D	8. elegant	A		
9. household	B	9. begroting	B		
10. gripping	C	10. boeiend	C		
Card 4		Kaart 4			
1. stars	A	1. sterre	A		
2. unexpected	D	2. beangs	D		
3. galaxy	A	3. trompetter	D		
4. emblem	C	4. onverhoeds	D		
5. orbit	A	5. astronomie	A		
6. primitive	B	6. simbolies	C		
7. ritual	B	7. meteor	A		
8. meteor	A	8. patriotisme	C		
9. patriotism	C	9. ritueel	B		
10. silhouette	D	10. silhoeër	D		
Card 5		Kaart 5			
1. harbour	A	1. hawe	A		
2. memorise	D	2. studeer	D		
3. academic	D	3. opstandig	B		
4. conflict	B	4. akademie	D		
5. reprimand	B	5. doeane	A		
6. authority	B	6. memoriseer	D		
7. customs	A	7. heffing	A		
8. levy	A	8. konflik	B		
9. malcontent	B	9. outoriteit	B		
10. affluence	C	10. vermoënd	C		

Comments/Opmmerkings: _____

TEST 2: COMPREHENSION/TOETS 2: BEGRIP

DISCONTINUE the test after 4 consecutive zero scores.

STAAK die toets na 4 agtereenvolgende nultellings.

Item	Response Respons	Score Telling
1. toe toon		
2. illness siekte		
3. save spaar	*	
4. purse beursie		
5. go to school skoolgaan	*	
6. accused beskuldigde		
7. parks parke	*	
8. welfare organization welsynsorganisasie	**	
9. testament testament		
10. parliament parlement		
11. driver's licence rybewys		
12. buildings geboue		
13. hunt jaag		
14. promise belofte		
15. elections verkiegings		

* A comprehensive answer or two specific reasons./'n Omvattende antwoord of twee besondere redes.

** Examples of two general guidelines./Voorbeelde van twee algemene riglyne.

Comments/Opmmerkings: _____

TEST 3: SIMILARITIES/TOETS 3: OOREENKOMSTE

DISCONTINUE the test after 4 consecutive zero scores.

STAAK die toets na 4 agtereenvolgende nultellings.

Item	Response Reisoos	Score Telling
1. apple - orange appel - lemoen	(assistance) (hulp)	
2. shirt - coat hemp - baadjie	(assistance) (hulp)	
3. cat - dog kat - hond		
4. spade - pick graaf - pik		
5. piano - guitar klavier - ghitaar		
6. beer - wine bier - wyn		
7. theft - murder diefstal - moord		
8. telephone - radio telefoon - radio		
9. elbow - knee elmoog - knie		
10. anger - joy woede - blydskap		
11. mountain - river berg - rivier		
12. wealth - poverty rykdom - armoede		
13. honesty - faithfulness eerlikheid - getrouheid		
14. salt - water sout - water		
15. liberal - conservative liberaal - konserwatief		

Comments/Opmærkings: _____

TEST 4: NUMBER PROBLEMS/TOETS 4: GETALPROBLEME

7- to 12-year-old testees start with item 1.

13- to 16-year-old testees start with item 4. If a testee completes item 4 incorrectly, return to item 1. Otherwise give full credit for items 1, 2 and 3.

7- tot 12-jarige toetslinge begin met item 1.

13- tot 16-jarige toetslinge begin met item 4. Indien 'n toetsling item 4 verkeerd beantwoord, gaan terug na item 1. Gee andersins volle krediet vir items 1, 2 en 3.

DISCONTINUE the test after 5 consecutive failures (zero scores).

STAAK die toets na 5 agtereenvolgende mislukkings (nultellings).

Item		Response Resposns	Time (optional) Tyd (opsioneel)	Score Telling
Time limit Tydbepערking	Answer Antwoord			

Items 1-11 are presented orally./items 1-11 word mondeling gestel.

1	40"	2	(blocks) (blokke)		
2.	40"	4	(blocks) (blokke)		
3	40"	6			
4.	40"	6			
5.	40"	2			
6.	60"	8			
7.	60"	18			
8.	60"	40			
9	60"	5			
10	60"	200c/R 2			
11	60"	4			

Items 12-20 are also presented on cards./items 12-20 word ook op kaarte voorgelê

12.	80"	30			
13.	80"	75			
14.	80"	10			
15.	80"	12			
16.	80"	60			
17.	80"	105			
18.	80"	90			
19.	80"	9			
20.	80"	126			

Comments/Opmerkings: _____

TEST 5: STORY MEMORY/TOETS 5: STORIEGEHEUE

Acceptable response/Aanvaarbare respons
(*Acceptable alternative/Aanvaarbare alternatief)

Score
telling

- | | |
|--|---|
| <ul style="list-style-type: none"> <input type="radio"/> Mr <input type="radio"/> and Mrs <input type="radio"/> Smith <input type="radio"/> have two children. <input type="radio"/> John. <input type="radio"/> who is eight years old. <input type="radio"/> and Betty. <input type="radio"/> who is six. <input type="radio"/> Last Saturday <input type="radio"/> the family (the Smiths)* <input type="radio"/> went to the zoo. <input type="radio"/> The parents (Mr and Mrs Smith, the father and mother)* <input type="radio"/> decided to go <input type="radio"/> as the children (as John and Betty)* <input type="radio"/> had not been to the zoo before. <input type="radio"/> There were twenty <input type="radio"/> different kinds <input type="radio"/> of buck. <input type="radio"/> as well as lions <input type="radio"/> and tigers. <input type="radio"/> John <input type="radio"/> liked <input type="radio"/> the polar bears <input type="radio"/> that were playing with one another. <input type="radio"/> His sister (Betty)* <input type="radio"/> was interested (liked)* <input type="radio"/> in the brightly <input type="radio"/> coloured <input type="radio"/> parrots. <input type="radio"/> She also liked <input type="radio"/> the cute <input type="radio"/> monkeys. <input type="radio"/> In a circular <input type="radio"/> paddock <input type="radio"/> the elephants <input type="radio"/> sprayed one another with water. <input type="radio"/> By the time the children <input type="radio"/> had walked <input type="radio"/> through the zoo. <input type="radio"/> it was late <input type="radio"/> and the family (and the Smiths)* <input type="radio"/> decided <input type="radio"/> to go home. | <ul style="list-style-type: none"> <input type="radio"/> Mnr. <input type="radio"/> en mev <input type="radio"/> Smit <input type="radio"/> het twee kinders. <input type="radio"/> Jannie. <input type="radio"/> agt jaar oud <input type="radio"/> en Lettie. <input type="radio"/> ses jaar oud. <input type="radio"/> Verlede Saterdag <input type="radio"/> het die gesin (het die Smiths)* <input type="radio"/> dieretuin toe gegaan <input type="radio"/> Die ouers (Mr en mev. Smit, die pa en ma)* <input type="radio"/> het besluit om te gaan <input type="radio"/> omdat die kinders (omdat Jannie en Lettie)* <input type="radio"/> nog nie voorheen in die dieretuin was nie. <input type="radio"/> Daar was twintig <input type="radio"/> soorte <input type="radio"/> jukke. <input type="radio"/> asook leeus <input type="radio"/> en tigers. <input type="radio"/> Jannie <input type="radio"/> het gehou van <input type="radio"/> die ysere <input type="radio"/> wat me: mekaar gespeel het. <input type="radio"/> Sy suster (Lettie)* <input type="radio"/> het die papegaai <input type="radio"/> met hulle helder <input type="radio"/> kleure <input type="radio"/> interessant gevind. (gehou ver...)* <input type="radio"/> Sy het oor gehou van <input type="radio"/> die outlike <input type="radio"/> apies. <input type="radio"/> In 'n ronde <input type="radio"/> kamp <input type="radio"/> het die olifante <input type="radio"/> mekaar met water natgespuit. <input type="radio"/> Nadat die kinders <input type="radio"/> deur die dieretuin <input type="radio"/> gestap het. <input type="radio"/> was dit laat <input type="radio"/> en het die gesin (en het die Smiths)* <input type="radio"/> besluit <input type="radio"/> om huis toe te gaan. |
|--|---|

TEST 6: PATTERN COMPLETION/TOETS 6: PATROONVOLTOOIING

DISCONTINUE the test after 6 consecutive items (practice examples excluded) have been failed (zero scores).

STAAK die toets na 6 agtereenvolgende mislukte (nuttellings) items (oefenvoorbeelde uitgesluit).

Item	Time limit Tydbepèrking	Right/Wrong Reg/Verkeerd + / -	Time (optional) Tyd (opsioneel)	Score Telling
Practice examples/Oefenvoorbeelde				
A	40"			
B	40"			
C	40"			
D	40"			
Items 1-9 on the front of the folder./Items 1-9 op die voorkant van die omslag.				
1.	40"			
2.	40"			
3.	40"			
4.	40"			
5.	40"			
6.	40"			
7.	60"			
8.	60"			
9.	60"			
Items 10-15 on the back of the folder./Items 10-15 op die agterkant van die omslag.				
10.	60"			
11.	60"			
12.	60"			
13.	60"			
14.	60"			
15.	60"			

Comments/Opmærkinge: _____

TEST 7: BLOCK DESIGNS/TOETS 7: BLOKPATRONE

DISCONTINUE the test after 4 consecutive zero scores.

STAAK die toets na 4 agtereenvolgende nulresultate.

Item			Recht/Wrong Reg. Verkeerd + / -	Time (optional) Tyd (opsioneel)	Score Telling
Attempt Poging	Time limit Tydbepaling				
Items 1-7 - four blocks./Items 1-7 - vier blokkies.					
1. A	M*	90°			
B	M D	90°			
2. A	M	90°			
B	M D	90°			
3. A	NM D	90°			
B	NM D	90°			
4.		120°			
5.		120°			
6.		120°			
7.		120°			
Items 8-15 - nine blocks./Items 8-15 - nege blokkies.					
8.		150°			
9.		150°			
10.		150°			
11.		150°			
12.		150°			
13.		150°			
14.		150°			
15.		150°			

- * M The tester builds a model and leaves it on the table.
Die toetsafnemer bou 'n model en laat dit op die tafel bly.
- NM Only a design card is presented, not a model as well.
Net 'n ontwerpkaart word voorgelê en nie 'n model ook nie.
- D The tester demonstrates the item with the testee's blocks.
Die toetsafnemer demonstreer die item met die toetsling se blokkies.

Comments/Opmmerkings: _____

TEST 8: MISSING PARTS/TOETS 8: ONTBREKENDE DELE

hem		Response Respons	Time (optional) Tyd (opsioneel)	Score Telling
Missing part Ontbrekende deel	Time limit Tydbepanking			
1. tennis racket tennisrakat	20"	(assistance) (hulp)		
2. pig's tail vark se stert	20"	(assistance) (hulp)		
3. ball bal	20"			
4. doorhandle deur se handvatse	20"			
5. tyre (left rear: wheel) band (linkeragterwiel)	20"			
6. sock kous	20"			
7. tusk tand	20"			
8. collar halsband	20"			
9. trigger sneller	20"			
10. address adres	20"			
11. sleeve of the dress mou van die rok	20"			
12. lid of the teapot teepot se deksel	20"			
13. number 5 syfer 5	20"			
14. wing of the dragonfly naaldokker se vlerk	20"			
15. ear oor	20"			
16. one half of the jacket baadjie se een helte	20"			
17. handle (front door) handvatse (voorste deur)	20"			
18. heat switch hitteskakelaar	20"			
19. right rear wheel regteragterwiel	20"			
20. left front hoof voorste linkerhoef	20"			

TEST 9: FORM BOARD/TOETS 9: VORMBORD

Item		Right/Wrong Reg. Verkeerd - / -	Time Tyd	Score Telling
Pans Dele	Time limit Tydbepanking			
1.	yellow/geel	130"		
2.	brown/bruin	130"		
3.	green/groen	130"		
4.	red/rooi	130"		
5.	blue/blou	130"		
6.	white/wit	130"		

Comments/Opmmerkings: _____

**ADDITIONAL TEST - NOT PART OF THE COMPOSITE SCALES
 ADDISIONELE TOETS - NIE DEEL VAN DIE SAAMGESTELDE SKALE NIE**

TEST 10: MEMORY FOR DIGITS/TOETS 10: SYFERGEHEUE

DIGITS FORWARD/GEWONE VOLGORDE

DISCONTINUE Digits Forward after 2 consecutive zero scores and continue with Digits Backward.

STAAK Gewone Volgorde na 2 opeenvolgende nul tellings en gaan aan met Omgekeerde Volgorde.

Item	Series 1 Reeks 1	Right/Wrong Reg./Verkeerd - / -	Series 2 Reeks 2	Right/Wrong Reg./Verkeerd + / -	Score Telling
1.	1 - 4		6 - 3		
2.	2 - 8 - 5		1 - 7 - 4		
3.	4 - 5 - 1 - 8		2 - 6 - 4 - 1		
4.	6 - 9 - 2 - 8 - 3		7 - 2 - 9 - 6 - 5		
5.	3 - 8 - 4 - 7 - 1 - 9		5 - 2 - 7 - 6 - 1 - 6		
6.	3 - 6 - 7 - 8 - 2 - 4 - 9		9 - 3 - 2 - 6 - 4 - 7 - 5		
7.	8 - 5 - 6 - 2 - 7 - 5 - 5 - 3		2 - 5 - 3 - 8 - 6 - 7 - 3 - 9		
8.	6 - 4 - 8 - 5 - 1 - 3 - 2 - 5 - 7		4 - 6 - 5 - 7 - 2 - 3 - 8 - 9 - 1		

DIGITS BACKWARD/OMGEKEERDE VOLGORDE

DISCONTINUE Digits Backward after 2 consecutive zero scores.

STAAK Omgekeerde Volgorde na 2 opeenvolgende nul tellings.

Item	Series 1 Reeks 1	Right/Wrong Reg./Verkeerd - / -	Series 2 Reeks 2	Right/Wrong Reg./Verkeerd + / -	Score Telling
1.	3 - 1		5 - 3		
2.	2 - 7 - 5		4 - 9 - 2		
3.	9 - 1 - 8 - 2		7 - 3 - 4 - 8		
4.	3 - 5 - 2 - 6 - 7		8 - 3 - 4 - 6 - 2		
5.	6 - 2 - 9 - 4 - 7 - 5		3 - 1 - 9 - 6 - 6 - 4		
6.	6 - 3 - 6 - 9 - 1 - 4 - 7		6 - 1 - 3 - 7 - 5 - 2 - 8		
7.	4 - 6 - 1 - 5 - 9 - 2 - 7 - 8		7 - 3 - 6 - 9 - 6 - 5 - 1 - 4		
Total score for Memory for Digits Test/Totaal telling vir Syfergeheuetoets					

Comments / Opmerkings: _____

TEST 11: CODING/TOETS 11: KODERING

Key
 Sleutel

1	2	3	4	5	6	7	8	9
+	○	>	-	□	=	<	∩	×

Examples Voorbeelde													
3	2	4	1	6	8	5	7	1	6	2	3	1	5
4	2	7	4	6	1	6	3	7	5	4	7	2	9
1	7	4	2	8	1	9	5	2	6	9	6	3	5
8	1	3	5	8	4	7	6	8	4	2	6	8	9
3	7	2	8	3	7	9	3	5	9	4	7	8	9
2	5	4	1	9	5	3	7	8	4	9	6	3	7
1	8	5	7	2	8	4	9	8	6	2	5	9	1

Score/Telling	
Time limit/Tydbeperking	120'
Testee's time (optional)/Toetsing se tyd (opsioneel)	

BENDER VISUEEL-MOTORIESE GESTALTTOETS

NAAM DATUM

GEBORTE DATUM OUDERDOM

TOETS AFNEMER

No	Discorsie	Rotasie	Integrasie	Perseverasie	Tocaal	No
A	1a	2	3	[redacted]	[redacted]	A
	1b					
1	4	5	[redacted]	6	[redacted]	1
2	[redacted]	7	8	9	[redacted]	2
3	10	11	12a	[redacted]	[redacted]	3
			12b			
4	[redacted]	13	14	[redacted]	[redacted]	4
5	15	16	17a	[redacted]	[redacted]	5
			17b			
6	18a	[redacted]	19	20	[redacted]	6
	18b					
7	21a	22	23	[redacted]	[redacted]	7
	21b					
8	24	25	[redacted]	[redacted]	[redacted]	8
Tocale tel- ling		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Telling etc	10	8	9	3	10	[redacted]

NORMATIEVE DATA T O V D I E B E N D E R V I S U E E L - M O T O R I E S E G E S T A L T T O E T S

OUDE RD O M S O R G E P	GEMIDDELD:	1964	1974	ST. AFW.	1964	1974	SNYPUNT:	1964	1974
5-0	5-5	13,2	13,1	.....	3,8	3,3	.....	17,0	16,4
5-6	5-11	10,2	9,7	.....	3,3	3,4	.....	14,0	13,1
6-0	6-5	8,0	8,6	.....	3,3	3,3	.....	11,2	11,9
6-6	6-11	6,4	7,2	.....	3,8	3,5	.....	10,1	10,7
7-0	7-5	5,1	5,8	.....	3,6	3,3	.....	8,7	9,1
7-6	7-11	4,2	4,6	.....	3,4	2,8	.....	7,6	7,4
8-0	8-5	3,4	4,2	.....	3,1	2,5	.....	6,5	6,7
8-6	8-11	2,7	3,0	.....	2,8	2,5	.....	5,5	5,3
9-0	9-5	2,2	2,8	.....	2,5	2,2	.....	4,7	5,0
9-6	9-11	1,8	2,3	.....	2,2	2,1	.....	4,0	4,4
10-0	10-5	1,5	1,9	.....	1,8	1,9	.....	3,3	3,8
10-6	10-11	1,2	1,8	.....	1,5	1,8	.....	2,7	3,6
11-0	11-11	-	1,4	.....	-	1,4	.....	-	2,8

OPMERKING: