INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

Bell & Howell Information and Learning
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
800-521-0600

UMI®
Language Development in Children with Attention Deficit Disorder

by

Jody L. Bain
B.Sc., University of Western Ontario, 1977
M.A., University of Victoria, 1990

A Dissertation submitted in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY
in the Department of Psychology

We accept this dissertation as conforming to the required standard

Dr. M. Joschko, Supervisor (Department of Psychology)

Dr. N. Galambos, Departmental Member (Department of Psychology)

Dr. M. Hunter, Departmental Member (Department of Psychology)

Dr. A. Pence, Outside Member (School of Child and Youth Care)

Dr. C. Johnston, External Examiner, University of British Columbia

© Jody L. Bain, 2000
University of Victoria

All rights reserved. This dissertation may not be produced in whole or in part, by photocopying or other means, without the permission of the author.
ABSTRACT

Children with an attention deficit disorder (ADHD) exhibit a number of behavioural characteristics which include hyperactivity, impulsivity, and inattentiveness. They may experience difficulties in cognitive, academic, and social tasks which, in turn, may lead to rejection, perceived failure, and emotional upset. No clear etiology has been confirmed, with current research focusing on the role of genetics, environmental toxins, neurological factors, and parenting style. Common therapeutic interventions include medication regimes, social skills training, cognitive-behavioural therapy, and parental training in behaviour modification. Yet, reviews of these techniques suggest disappointing findings, with positive results being attributed to the prolonged monitoring of behaviours by parents/school staff rather than increased ability of a child to self-regulate and self-control.

The present study examined receptive, expressive, and pragmatic language abilities in 37 children, ages 6 - 10, diagnosed with an attention deficit disorder. A number of neuropsychological tests (Wechsler Intelligence Scale for Children - III: Clinical Evaluation of Language Fundamentals - 3; Test of Language Development - Primary and Intermediate; Test of Pragmatic Language; NEPSY Auditory Attention and Response Test) and questionnaires (Child Behaviour Checklist; Social Skills Rating System) were used to investigate the relationship between language functioning and social skills competency.
Analyses revealed no deficits on measures of receptive language and no gender differences (25 boys, 12 girls). However, significant differences were shown on expressive language tasks. The sample performed below the average range, with the older group of children (ages 9 -10) having significant difficulties compared with the younger group of participants (ages 6 - 8). These deficits in language ability were related to issues in social competency including the presence of Internalizing and Externalizing behaviours. The results support research that suggests this disorder is not exclusively a deficit of attention.

Examiners:

Dr. M. Joschko, Supervisor (Department of Psychology)

Dr. N. Galambos, Departmental Member (Department of Psychology)

Dr. M. Hunter, Departmental Member (Department of Psychology)

Dr. A. Pence, Outside Member (School of Child and Youth Care)

Dr. C. Johnston, External Examiner (Dept of Psychology, University of British Columbia)
TABLE OF CONTENTS

Title Page ................................................................. i
Abstract ........................................................................ ii
Table of Contents ............................................................ iv
List of Tables .................................................................. vi
List of Appendices ............................................................ viii
Acknowledgment .............................................................. ix
Rationale for Topic Selection .................................................. 1
Introduction ....................................................................... 9
  Attention in Children .......................................................... 9
  Attention Deficit Disorder in Children. .................................. 10
  Co morbid Diagnoses in Children with Attention Deficit Disorder .......................................................... 16
Language Acquisition ......................................................... 20
Language as a Form of Social Communication ......................... 22
Development Disorders of Language ....................................... 25
Development Disorders of Language in Children with an
  Attention Deficit Disorder .................................................... 28
Social Competence in Children. ............................................... 36
Social Competence in Children with an Attention Deficit Disorder ...................................................... 37
Summary ........................................................................... 40
Method ............................................................................. 44
  Sample ............................................................................. 44
  Procedure .......................................................................... 47
  Instrumentation ................................................................. 49
Results ................................................................................ 56
  Descriptive Sample Statistics ................................................ 56
LIST OF TABLES

Table 1. Clinical Sample Characteristics by Gender........................................46
Table 2. Clinical Sample Characteristics by Age Group.................................47
Table 3. Tests Administered...........................................................................48
Table 4. Descriptive Statistics of Variable Scores for the Clinical Sample........57
Table 5a. Receptive Language Abilities.........................................................60
Table 5b. Receptive Language Abilities by Gender for the Clinical Sample........61
Table 5c. Receptive Language Abilities by Age Group for the Clinical Sample....61
Table 6a. Expressive Language Abilities.......................................................63
Table 6b. Expressive Language Abilities by Gender for the Clinical Sample......64
Table 6c. Expressive Language Abilities by Age Group for the Clinical Sample...65
Table 7a. Pragmatic Language Abilities..........................................................66
Table 7b. Pragmatic Language Abilities by Gender for the Clinical Sample.......66
Table 8a. Composite Standard Score Means and Standard Deviations for CELF and TOPL by Gender and by Age Group for the Clinical Sample........68
Table 8b. Composite Standard Score Means and Standard Deviations for TOLD Listen and TOLD Speaking by Gender and by Age Group for the Clinical Sample........................................68
Table 9. Analysis of Variance Significance for Composite Standard Score by Age and Gender for the Clinical Sample ..........................................74

Table 10. Correlation Coefficients between all Measures for the Clinical Sample ..................................................................................76

Table 11a. Standard Multiple Regression of CELF Receptive Language on Measures of Social Competency ........................................77

Table 11b. Standard Multiple Regression of CELF Expressive Language on Measures of Social Competency ........................................78

Table 11c. Standard Multiple Regression of TOLD Speaking on Measures of Social Competency .......................................................78

Table 11d. Standard Multiple Regression of TOLD Listening on Measures of Social Competency ......................................................78

Table 11e. Standard Multiple Regression of TOPL on Measures of Social Competency .................................................................79
LIST OF APPENDICES

Appendix 1. DSM IV DIAGNOSTIC CRITERIA FOR ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (Diagnostic and Statistical Manual - IV (American Psychiatric Association, 1994) ..............................................................111

Appendix 2. COMMUNICATIVE COMPETENCE - COMPETENCY FEATURES (Simon, 1981).............................................................................................................113

Appendix 3. COMMUNICATIVE COMPETENCE - INCOMPENTENCY FEATURES (Simon, 1981)........................................................................................114

Appendix 4. STAGES IN THE ACQUISITION OF PRAGMATIC LANGUAGE (Reed, 1986, p. 294)........................................................................................................115

Appendix 5. Consent Form................................................................................116

Appendix 6. Examiner's Script for Child Participants.......................................118
Rationale for Topic Selection

It has been suggested that 20 to 40 percent of children who attend school have some difficulty learning one or more specific skills inherent in successful completion of their academic program (Lyon, 1994). This broad category of learning disabilities comprises disorders in written and spoken language, speech, phonetics, syntax, and mathematical calculation and reasoning. Often, accompanying each of these difficulties are deficits in attention as well as impairments in social competency.

Throughout the literature there are many different viewpoints as to the origin and nature of specific learning difficulties, and attempts have been made to provide a unique description of each type of problem. Failures to quantify and predict a child's behaviour accurately - particularly within the school setting - reflect many issues including the difficulty in measuring change in both normal and abnormal development, poorly constructed tools of measurement, and attempts to establish the uniqueness of a particular disorder without consideration for concomitant problems. It therefore becomes important to understand each specific disorder within the context of the entire development of a particular child, and children in general. Viewing all forms of learning disabilities as occurring along a continuum permits a framework in which to examine and describe behaviours.
Attention deficit disorder (ADHD) has been conceptualized as a disorder involving difficulties in attention span, self-regulation, and impulse control. Two subtypes allow for distinction between children who exhibit problems primarily with attention (*Inattention*), and those who evidence hyperactivity and impulsivity (*Hyperactive-Impulsive*). In either case, ADHD is often classified as a behavioural disorder rather than a cluster of symptoms suggestive of delays in language or cognitive functioning. Viewing an attention deficit disorder (ADHD) as a type of learning difficulty may offer an alternative approach to its understanding. In addition, this approach may lead to an improvement in assistance offered to children with ADHD, and their families.

Past descriptions of attention deficit disorder in children have focused on motor problems, damage to the brain (or a neurochemical imbalance) (Still, 1902), behavioural aspects, and problems with attention (Barkley, 1997). Communication issues have generally been overlooked (Giddan, 1991) despite the fact that the DSM-IV (Diagnostic and Statistical Manual for Mental Disorders - Fourth Edition, 1995) criteria for diagnosis of ADHD includes: "blurs out answers to questions before they have been completed"; "interrupts or intrudes on others (e.g., butts into conversations or games)"; and "talks excessively", all reflecting possible problems with aspects of expressive language skills. The DSM-IV also notes that a child with ADHD "often does not seem to listen when spoken to directly", which suggests a possible difficulty in receptive language. Many of the other symptoms listed as primary characteristics of this disorder
focus on apparent problems children may have following through on instructions, organizing and completing tasks, and being mindful of mistakes within their work. In addition, Shaywitz, Fletcher, and Shaywitz (1994) suggest that, in the assessment of ADHD, most behaviours surveyed on questionnaires for parents/caregivers and teachers (e.g., Conner's Rating Scales; Conners, 1997); Child Behaviour Checklist [CBCL]; Achenbach & Edelbrock, 1983) do not address possible cognitive attributes or processes of attention. For example, Fletcher and colleagues list the following items from the Attention Problems subscale of the CBCL and state that FEW are directly involved with attention: “acts too young for his/her age; can't concentrate, pay attention for long; confused or seems to be in a fog; daydreams or gets lost in his/her thoughts; nervous, high-strung, or tense; poor school work; poorly coordinated or clumsy; stares blankly (p. 106).

Rather than viewing the difficulties a child with ADHD may experience as primarily reflecting problems of inattention, it is reasonable to examine these developmental delays from the point of view of Luria (1973) and Vygotsky (translation - Kozulin, 1996). They have proposed an interdependent relationship between thought, language, and resultant behaviours, suggesting that behavioural problems may be understood by first understanding the child’s competency in external and internal language. Consequently, any speech activity may be viewed as a special form of social communication that acts as a tool for intellectual activity and is a method of regulating or organizing human mental processes.
A survey of the literature indicates that there are four primary factors involved in the development of language. *Conceptual development* involves the pool of knowledge and meaning that underlies language. Language contributes to the development of concepts and knowledge but it is also reciprocal. Language derives from knowledge and, through its development, contributes to knowledge.

Language involves *information-processing skills* so that an individual may take in information and express himself. Thus, it relies on intact sensory systems, memory, cognitions, and intermodal connections. *The use of language* is, therefore, a means to communicate. It has social and cognitive aspects which make it important in the development and maintenance of *human relationships*.

Language impairment may occur at the level of any one of these processes. Most often an impairment in any form of language skill is defined as an isolated phenomenon, although it is widely accepted that language neither develops nor functions in isolation. However, the relationship between language, cognition, behaviour, and social development is often ignored in psychological and developmental research. As Brinton & Fujiki (1993, p. 194) note "(c)hallenging behaviour has often been perceived as an obstacle that must be dealt with before language treatment can proceed. Psychiatric disorders have been seen as clearly removed from the clinical category of language impairment." This is despite earlier definitions of communication disorders which had focused on the influence of communication breakdown on social and
psychological aspects of behaviour. As Wendel Johnson (1946, p. 243) states, "(I)eaving any consideration of language behaviour out of a discussion of personality would be something like leaving the cheese out of a cheese soufflé." Viewing ADHD as a syndrome characterized by the single deficit of attentiveness underemphasizes the role of language and cognition in the initiation, maintenance, and monitoring of behaviour; in this case, poor regulation of behavioural control and self-regulation.

Barkley's past research on ADHD (1990, 1991, 1992, 1994, 1996) involved investigating the apparent lack of self-talk that mediates rule-governed behaviour and therefore renders the child unable to plan skillfully in any social environment. In 1997, he presented his current theoretical model of ADHD (he describes attention deficit disorder with accompanying Hyperactivity/Impulsivity, and not the Inattentive subtype) in which he suggests that this disorder is characterized by difficulties in behavioural disinhibition, rather than inattention. Expanding upon Bronowski’s (1977) hypotheses regarding the singleness of human language, as well as neuropsychological evidence of the involvement of prefrontal cortex in the self-regulation of emotion and affect, and in social behaviour (e.g., Eslinger, Grattan, Damasio, & Damasio, 1992) Barkley has created a model of overall executive functioning. He believes that behavioural inhibition (inhibition of a prepotent response, stopping of an ongoing response, and interference control in the intervening period) is the forerunner of effective and efficient self-regulation. Executive functions are examples of self-regulating behaviours. Barkley states that, as a child develops, behaviour is initially
controlled by language of others, the self-generated language of the individual
which is initially overt and then becomes covert, and an ongoing search for novel
solutions to problems. Furthermore, he conceptualizes that the following eight
executive functions may be impaired in children with ADHD: 1) nonverbal
working memory; 2) verbal working memory or internalization of speech; 3)
sense of time; 4) internal representation of information and its reformulation; 5)
private and internal emotional responding; 6) imitation and replication of intricate
actions of other individuals; 7) internalization of “thinking” behaviour; and 8)
“goal-directed persistence, volition, and free will” (Barkley, 1997; p. ix). Thus,
according to this model, ADHD is not exclusively a disorder of attention, but
rather a cluster of developmental difficulties including such emergent cognitive
functions as language, memory, and thinking, with resultant difficulties in a
variety of social settings.

Much, if not most, of social interaction for all children is achieved through
the use of language. In addition, many children with ADHD have difficulties in
structured settings, such as school and organized classroom venues. Lapadat
(1991, p. 77) states that “(s)chooling is largely about teaching language skills and
using language as a medium for conveying society’s accumulated wisdom (social
knowledge). Most school teaching uses the medium of language.” However,
referrals to speech/language pathologists for children with ADHD are rarely
sought or funded (personal communication, J. Comer, Speech/Language
Pathologist, 1997).
Research has also indicated that children with ADHD are more likely to cry and/or act out which Giddan (1991) has suggested possibly reflects a focus on external stimuli and underdeveloped inner or self-regulatory speech. Estimates of the co-occurrence of an attention deficit disorder with or without an accompanying hyperactivity in individuals with learning disabilities range from 10% (Holborow & Berry, 1986; Shaywitz, 1986) to 80% (Safer & Allen, 1976).

It appears reasonable, therefore, to speculate that children with ADHD have a number of characteristics including difficulties with attention, behavioural regulation, and academic achievement which, in turn, may lead to problems with social acceptance by peers. This study focuses on the role of one underlying process which may affect these children's competence in a number of areas, namely, the role of language in behavioural control. Barkley (1997) has suggested that verbal working memory and the internalization of speech are essential in the development of a child. They permit an individual to evaluate an event before responding to it, in whatever way is deemed appropriate. Vygotsky (1960) had previously proposed that, during the development of a child, speech becomes a method of regulating behaviour. He suggested that internal speech plays a prominent role in the transition from thought to plan. This study examines the linguistic ability in children with ADHD because these children are diagnosed based upon a number of characteristics which suggest they have difficulty regulating their own behaviours. Specifically, three types of language will be examined; receptive, expressive, and pragmatic abilities. In brief, receptive language skills include the ability of an individual to understand the
meaning and syntactic structure (grammar) of the speech of others. Expressive abilities focus on the skills necessary to formulate ideas, choose correct words, and organize these particular words into a grammatical message. Finally, pragmatic language involves the usage of language as a tool for communication. It is hypothesized that:

1) Children with an attention deficit disorder will have weaker receptive language abilities than a normative group of same-aged children.

2) Children with an attention deficit disorder will have weaker expressive language abilities than a normative group of same-aged children;

3) Children with an attention deficit disorder will have weaker pragmatic language abilities than a normative group of same-aged children; and

4) Children with an attention deficit disorder will reveal stronger receptive language abilities than expressive skills, and stronger expressive skills than pragmatic language abilities, overall.

Findings are be used to recommend specialized language-based intervention and remediation techniques for these children.
INTRODUCTION

Attention in Children

The process of attention is not a single entity. It is comprised of many diverse processes involved in the environmental guidance of behaviour and self-regulation. Researchers (Mirsky, 1987; Posner, 1988; Cooley & Morris, 1990) have focused their studies on different components of attention including:

1. alertness/arousal - the activity and responsivity of the individual within the general environment;

2. impulsivity - the time between the event and an individual's response to it;

3. selective or focused attention - particular spatiotemporal facets of certain events to which the individual selectively responds;

4. sustained attention or persistence of action - the time period over which the response is maintained;

5. divided attention - an individual must pay attention and respond to two different tasks simultaneously;

6. search - strategy used by an individual to inspect and evaluate the events in the environment; and

7. encode - capacity to retain information in working or short-term memory (Barkley, 1994).
Attention is also directed by multiple stimuli and if the "appropriate" (i.e., expected, usual, normal) response does not occur, the resultant behaviour may be thought of as reflecting *inattentiveness*. Furthermore, many lapses of attention may be due to straightforward differences in the history of learning and acquiring a particular discrimination. For example, a school bell may prompt certain responses in a teacher, centering around such issues as responsibility to the students, orderliness, and school decorum, but may not generate a similar set of behaviours in a child on the school ground. There may be differences among individuals regarding the various stimuli to which they may choose to attend, or an individual may end up devoting more attention to some stimuli than is warranted or judged appropriate by another. Each person has to determine which aspects of the situation are relevant for effective performance and which are not.

**Attention Deficit Disorder in Children**

There has been confusion in the literature between the psychological construct of attention, and the behavioural syndrome of an attention deficit disorder (Barkley, 1990; Teeter & Semrud-Clikeman, 1997). The term ADHD had its genesis in the belief that deficits in attention are most fundamental to and underlie the clinical syndrome; this hypothesis has yet to be empirically confirmed. The core symptoms of ADHD are *behavioural* characteristics, rather than deficits in specific cognitive processes.
Children identified as having an attention deficit disorder represent a heterogeneous population. However, studies of gender differences have indicated that boys are at least three times more likely to be diagnosed with this disorder, across all cultures. ADHD is currently defined by specific criteria in the Diagnostic and Statistical Manual IV (DSM IV) (Appendix I), which include difficulties with inattentiveness, hyperactivity, impulsivity, social, academic, and occupational functioning not otherwise diagnosed as a pervasive development disorder (e.g., Autism) or schizophrenia.

In November 1998, the National Institutes of Health published a Consensus Development Conference Statement on the diagnosis and treatment of ADHD (NIH, 1998). Within the document it is stated that children with this disorder may have academic and social difficulties due to major symptoms of inattentiveness, poor concentration, overactivity, distractibility, and impulsivity - which in turn may add to or create further difficulties in the family such as financial burden and marital separation. There have been a number of theories presented as to the etiology of these distinguishing behavioural traits, including brain trauma (Still, 1902); Minimal Brain Damage (MBD - symptoms with no obvious neurological signs of injury) (Kessler, 1980); decreased blood flow to the basal ganglia; early hypoxic ischemic brain injury; difficulty in learning (McGee & Share, 1988); depression; heredity; developmental right-hemisphere-deficit syndrome (Sunder, DeMarco, Fruitiger & Levey, 1988); frontal-lobe dysfunction (Conners & Wells, 1986); dysfunction of any of nine control systems: vocal,
sensory, associative, appetite, social, motor, behavioural, communicative, and affective (Levine, 1987); and damage to dopaminergic neurons (Kolb & Whishaw, 1996); see Barkley (1990) for a review of the etiology of ADHD). However, there has never been an independent valid test for the diagnosis of ADHD and thus prevalence rates range from 3% to 9%, and upward to 25% percent of the elementary student population. In addition, ADHD often presents with a number of co-morbidities, including Oppositional Defiant Disorder or Conduct Disorder (APA, 1994). Treatment often focuses on the use of stimulant medication, such as methylphenidate and dextroamphetamine, because cognitive-behavioural interventions, given alone, have been found to be ineffective especially over the long-term. Harris (1995), argues that behaviour modification should be combined with “appropriate diagnosis and drug treatment” (p. 397). Although short-term trials of these medications often ameliorate core symptoms, there is little lasting improvement in academic or social skill achievement, suggesting again, that this disorder is not exclusively a disorder of attention (Barkley, 1997). Satterfield, Satterfield, and Schell (1987) have suggested that multimodal treatment, which may include intervention with the child such as behaviour modification, pharmacotherapy, social skills group, academic skills training and individual therapy, as well as family therapy, is the most effective approach. The University of Washington has developed the PATHS (Providing Alternative Thinking Strategies) program for school-based intervention. The focus is on enhancing social competence and social understanding in a classroom setting. The authors of this program (Kusche & Greenberg, 1991) incorporate as their goals a number of strategies that involve language development such as the
enhancement of the vocabulary of logical reasoning (e.g., if…… then statements) and the vocabulary of emotions and emotional states, implying that there may be deficits in language development in the children with ADHD.

Tannock, Purvis, and Schachar (1993) and Zentall (1988) have examined narrative production in children with ADHD. This involves storytelling and retelling, describing past experiences, and giving directions. In confirming the previous work of Zentall, Tannock and colleagues examined narrative abilities in 30 boys with ADHD and in a control group matched for sex, age, and IQ. She found that, although there were no differences between the two groups for narrative comprehension, the group with ADHD had deficits on narrative production. It seems reasonable to suggest that this profile of results may be explained, in part, as reflecting average receptive abilities but weaker expressive language development.

Problems with attention or a suspected attention deficit disorder remain one of the primary reasons for referral of a child to a health services provider (Barkley, 1990). This will often be described by a cluster of issues including inattentiveness, overarousal, hyperactivity, impulsivity, and a difficulty with delayed gratification. In addition, there is a difficulty with interaction in all aspects of the child's environment at home and at school (e.g., poor social skills, aggression, risk behaviours). Children with ADHD have difficulties with response inhibition and sustaining attention to tasks (vigilance). Their behaviour is described as impulsive and, especially within a classroom setting, they are noted
to be restless, overly active, and fidgety, with poor rule-governed behaviour which Barkley (1996) defines as the control of behaviour by language. Academic achievement may be below grade expectation and the child often has difficulty adjusting to even small changes within a routine. There are no unequivocal, positive developmental markers for ADHD and a diagnosis is confirmed by persistence, intensity and clustering of symptoms rather than presence or absence of symptoms (Conners, 1975a). Unfortunately, the uneven and unpredictable behavioural pattern often leads to an erroneous belief that these are problems of motivation and desire as well as wishful sabotage, rather than reflective of an underlying neurodevelopmental disorder. In general, however, the majority of children with ADHD appear to outgrow the core symptoms by late adolescence or adulthood (Weiss & Hechtman, 1986; Gittelman, Mannuzza, Shenker & Bonagura, 1985). Others, (up to one-third), do have a long history of negative interaction with the environment and appear to be affected for life (Moffitt, 1990).

Attention is considered essential to all forms of learning. "Without attention being directed to what is critical, for an appropriate span of time, important information is lost and learning is affected detrimentally" (Reed, 1986). With respect to communication, children must selectively attend not only to a full range of linguistic variables, such as the form and content of what is being said, but also to a wide range of paralinguistic factors (intonation and gesture) and extralinguistic factors (physical context and communicative partner). It may be
difficult for any child to always select what is critically important, but these problems will be exaggerated in a child who has an attention deficit disorder.

The disorder is more prevalent in boys, and the core symptoms may continue on into adulthood. In a search for a cause, some of the current research has been examining the role of genetics through studies of twins. Gillis and her colleagues (Gillis, Gilger, Pennington, & DeFries, 1992) found that between 55 and 92 percent of identical twins of siblings with ADHD will also develop the disorder. In a similar study of heritability, Gjone, Sundet, and Stevenson (1996), found that genetic factors can be used to explain 80 percent of the differences in levels of attention, hyperactivity, and impulsivity between children with ADHD and control groups.

In summary, since the publication of Still in 1902, there have been a number of proposals regarding the etiology of an attention deficit disorder, including neurological and cortical damage, heredity, and psychiatric illness. Currently, children are diagnosed with an ADHD based upon widely accepted criteria such as those stated in the DSM-IV which survey behaviours of inattentiveness, hyperactivity, and impulsivity. Yet, research has suggested that ADHD may not be a disorder of attention, per se, but instead reflects deficits in a number of areas including verbal and nonverbal working memory (Barkley, 1997), language (Tannock, 1998), speech/central auditory processing (Cook, Mausbach, Burd, Gascon, Slotnick, Patterson, Johnson, Hankey, & Reynolds, 1993), and executive functions (Barkley, 1997; Robin, 1998), including tasks of
time estimation (Grskovic, Zentall, & Stormont-Spurgin, 1995; Zakay, 1992). Other work has focused on the ability of children with ADHD to respond appropriately to emotionally-laden events, and to accurately encode and recall the impact of a particular stimulus (or event) on themselves and others (K. Kerns, University of Victoria, personal communication, 1999; Cole, Zahn-Waxler, & Smith, 1994). In general, researchers are currently investigating both the cognitive and behavioural domains of this disorder but further investigation is required to the relationship between specific cognitive deficits, including but not exclusive to attention, and behavioural patterns. An area that has received little extensive search is the role of language and its involvement in self-regulation and self-control.

**Co morbidity Diagnoses in Children with Attention Deficit Disorder**

In one study which compared parental stress in families with a child with ADHD to families with a child with LD, a higher level of parenting stress was seen in the first group (Baker & McCal, 1995). Similarly, Johnston (1996) reported in her study of 48 families that the degree of oppositional-defiant disorder was also related to parenting stress. It has been suggested that upwards to 50% of children with an attention deficit disorder will also have some type of specific learning disability (LD). Kaplan, Crawford, Fisher, and Dewey (1998) found that families, in which there is a child with ADHD, have significantly more problems than families with a child who has a Reading Disability (RD). These, and similar findings, have generated a large amount of research which examines the
prevalence and incidence of co-morbidity in ADHD, including the presence of a specific learning disability and/or a concomitant behavioural disorder such as Oppositional Defiant Disorder (ODD) and Conduct Disorder (CD).

In the U.S., children with learning disorders are defined as follows:

*Those children who have a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or do math calculations. The term includes such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. The term does not include children having learning problems which are primarily the result of mental retardation, of emotional disturbances, or of environmental, cultural, or economic disadvantage. (U.S. Congress: Public Law 94-142, 1975).*

Children with ADHD have been often found to score below same-age peers on tests of academic achievement (Barkley, DuPaul, & McMurray, 1990) even at the preschool level. Barkley and colleagues suggest that 19% to 26% of children with ADHD have at least one form of a learning disability, which may include deficits in reading, written expression and/or language usage (e.g., spelling and punctuation), and mathematical computation below the 7th percentile. Taking a less conservative approach in which a learning disability is based upon a significant discrepancy between scores on standardized tests of intelligence and academic achievement, then over 50% of children with ADHD have a learning disability (Lambert & Sandoval, 1980). If one considers a learning disability to be reflected by achievement levels two grades below actual school placement, upwards to 80% have an LD. The greatest amount of
research in learning disabilities has been on reading disorders. Pennington and colleagues (e.g., Gilger, Pennington, & DeFries, 1992) have found that the genetic etiology for ADHD and reading disability is different; early ADHD may, however, predispose children to have difficulties in school and develop a reading disability, whereas early reading problems do not give rise to symptoms of ADHD. This recent research contrasts previous studies (e.g., McGee & Share, 1988) whose authors suggested that academic skills deficits would lead to a display of symptoms consistent with the diagnosis of ADHD. Instead, it now appears that ADHD may lead to academic problems (Silver, 1990) in some instances if the child’s ability to focus attention is diminished or if the child makes decisions (e.g., answers questions) in an impulsive manner. Researchers have also offered that there may be a third variable that leads to both ADHD and academic problems (Hinshaw, 1992). Further research is warranted to investigate the possibility that language development may be implicated in this postulated third factor. Sergeant (2000) has found that there are no deficits of processing at the level of information encoding, nor are there significant decrements in arousal. Sergeant has also argued that Barkley’s notion of failure of inhibition (an executive function) could be applied not only to children with ADHD to explain some of the deficiencies but, as well, to those with oppositional defiant and conduct disorders. In addition, Reader, Harris, Schuerholz, and Denckla (1994) have found no significant differences between children with ADHD – with and without a reading disability, again suggesting that ADHD cannot be explained solely on the basis of an executive function deficit.
Tannock and her colleagues have investigated the pragmatic and semantic language abilities of children with ADHD as well as the influence of concurrent reading disabilities on performance (Purvis & Tannock, 1997). They found that the narrative deficits in children with both ADHD and RD were different than those with ADHD alone, who exhibited difficulties organizing and monitoring their story retelling. More recently, Purvis and Tannock (2000) have shown in a group of children with reading disabilities that these children are significantly impaired on measures of phonological processing relative to control groups and a group of children with ADHD, suggesting that reading disability and ADHD are distinctive deficits. Riccio & Jemison (1998) had previously offered that phonological processing deficits were found in both ADHD and RD to the same degree, but they did not provide any empirical support. Javorsky (1996) found, in their study of 96 participants, that participants with ADHD were significantly different from a group of children with ADHD and concurrent language deficits on measures of phonology and syntax. This finding has also been supported by Shaywitz and Shaywitz and colleagues (Shaywitz, B.A., Fletcher, J.M., Holahan, J.M., Marchione, K.E., Stuebing, K.K., Francis, D.J., Shankweiler, D.P., Katz, L., Liverman, I.Y., Shaywitz, S.E., 1995) and Hynd and colleagues (Hynd, Morgan, Edmonds, & Black, 1995) who conclude that ADHD and RD are separate disorders that may co-occur.

Researchers have also examined the whether the presence of a comorbid oppositional defiant disorder or conduct disorder influences the behavioural correlates of ADHD. A number of findings have suggested that each
group (ODD / CD / ADHD) has a distinct profile (Kuhne, Schachar, Tannock, 1997) although language disorders have been found in each group (Speltz, DeKlyen, Calderon, Greenberg, & Fisher, 1999).

In summary, researchers now believe that many children with ADHD also have a learning disability but that these co morbid disorders are separate (Fletcher, Shaywitz, & Shaywitz, 1999). ADHD is often accompanied by a language disorder such as a decrease in verbal production, fluency, and speed (Pineda, Restrepo, Henao, Gutierrez-Clellen, & Sanchez, 1999), but these linguistic deficits cannot be predicted based upon another common co morbid disorder, such as oppositional defiant disorder or conduct disorder (Chang, Klorman, Shaywitz, Fletcher, Marchione, Holahan, Stuebing, Brumaghim, & Shaywitz, 1999).

**Language Acquisition**

Children begin to elicit *recognitory comprehension* (reveal an interest in a specifically named object) just before one year of age and shortly after will begin to use general nominals (names of objects and animals) with later development of personal-social words (Leonard, 1994). Within the subsequent twelve months, many children progress to using four- and five-word utterances. By two years of age the conversations of children begin to share topics with adults and within the next year up to 50% of a child's speech contains *contingent utterances* (speech acts which share the same topic and add new information) (Simon, 1981).
During the middle of primary school (ages 6 to 8), the frequency of conversational overlap diminishes markedly but if interruptions occur, these children will attend to them.

Linguistic competence is just one part of the process of language acquisition (see Appendix 2 & 3); it is equally important to understand the development of a child's communicative competence, the ability of an individual to "convey effectively and efficiently an intended message to a receiver" (Wilcox, 1984 p. 102). Before a child even utters the first word, intentional communication through gestures has occurred which is later augmented by the addition of a spoken vocabulary. Halliday (1975) has suggested that these gestures and vocalizations serve a number of social language functions, including a child's actions upon the environment to satisfy physical needs (Instrumental language function), to control the actions of other persons (Regulatory language function), or to establish and maintain contact with another individual (Interactional language function). As adults and older children continue to interact with a younger child, this child begins to expand verbal and nonverbal communication skills such as vocabulary, word combinations, and the intent of conversation. By school-age, a child learns to comprehend words that express spatial (relationships in space), temporal (relationships in time), and kinship (possessives) relationships. As well, syntactic (e.g., active and passive verb tenses) relationships are produced although not necessarily understood by the child.
Language as a Form of Social Communication

The theory of A.R. Luria (1973) encompasses explanations of mind, speech, and the relationship between them. He suggested that the formation of language occurring in social development provides children with a new method for ordering mental processes and transmitting information. Initially, after birth, a child's verbal activity plays no significant role in organizing behaviour. Verbal instruction may initiate behaviour but it has no inhibitory function and is still subordinate in influence on an orienting reflex. By adapting the methods created for verbal communication to their own needs, children develop forms of intelligent perception, voluntary attention, active recall, abstract thought, and voluntary behaviour. Thus, language is an active process in which children develop speech in order to communicate with adults and get them to satisfy needs - both physiological and intellectual. Speech, in turn, begins to play a decisive role in the mediation of mental processes; "speech - it is the highest regulator of human behaviour" (Luria, 1973, p. 15).

Luria suggested that speech may be expressive (the motive or general idea of the expression) or impressive (receiving speech from another source). More recently, impressive speech is termed receptive language. Language may also be either excitatory or inhibitory. As an excitatory stimulus, a young child will respond to the simple arousing action of a verbal instruction or command without, in all likelihood, understanding the exact intent. Therefore, the child's actions are impulsive in nature; the child does not readily eliminate the influence of irrelevant
factors, nor does the child understand the social aspects of attention. As an inhibitory process, language serves as a tool for the child to develop internal, voluntary attention, and thus behaviours become more selective "... subordinated no only to the audible speech of an adult, but also to the child's own internal speech ..." (Luria, 1973, p. 264).

Developmentally, the excitatory or impulsive aspect precedes the inhibitory or semantic (meaning) aspect of spoken language until ages 4 to 4.5 years in most children. Luria (1973) suggested that before this age the prefrontal regions of the brain are not fully developed which, in turn, interferes with systematic and organized volitional actions during both general behaviours and speech activity in particular. Young children have marked difficulty executing novel tasks; these particular actions are organized with the help of one's own external and/or inner speech and without these skills a child at 3 to 4 years of age will exhibit many examples of impulsive behaviour. Speech, at this initial stage, has not yet gained its directive role.

Speech then becomes characterized by the influence of the excitatory or impulsive aspect of speech that can regulate the child's motor behaviour. During this period of development, if there is a conflict between the semantic aspect and the impulsive aspect of speech, the impulsive will dominate. A child will rely on the action of speaking in order to effect a change, rather than using specific words and phrases for clarification. Only in the third stage does the semantic aspect of speech assume its pre-eminence. When this occurs, children no
longer rely on their own externally vocalized speech to regulate behaviour. Language then becomes multi-dimensional. It is a form of social communication it is a tool for intellectual activity; and it is a method of organizing or regulating mental processes.

Luria (1961) suggested that higher mental processes are not innate mental properties but follow a developmental course that, for most mental activities, correlates with the developmental progression to internalized speech. Inner speech becomes the chief mechanism for volitional acts because of its capacity for formulating new mental connections. Spoken language is the means by which higher mental processes derive their sociocultural origins.

Luria (1973) also proposed that "any organized human mental activity possesses some degree of directivity and selectivity ... we respond to only those few which are particularly strong or which appear particularly important and correspond to our interests, intentions, or immediate tasks" (p. 256). Attention is the process by which one chooses the essential elements for mental activity and maintains the precise and organized course of this activity. A young child does not immediately develop the ability to obey even a direct, simple verbal instruction focusing his attention toward a certain object. A spoken instruction cannot overcome factors of involuntary attention competing with it. Not until 4.5 to 5 years of age is this ability to obey spoken instruction strong enough so that the child is easily able to eliminate the influence of all irrelevant and distracting factors. By school age, internal voluntary attention has become established as a
stable form of selective behaviour, subordinated not only to the audible speech of an adult but also to the child's own internal speech. The forms of selective behaviour organized with the participation of speech may have developed to such an extent that they can significantly change the course of movements and actions. As a child develops, attention of others is directed through the child's social communication, words or gestures. Luria contends that voluntary attention (the ability of the subject to verify his own behaviour) "is not biological in origin but a social act" (p. 256).

Therefore, through the early years of development, children begin to learn words, which they later combine into phrases and sentences for narration, "as a method of analysis and generalization for incoming information and ... as a method of formulating decisions and drawing conclusions" (Luria, 1973, p. 307). Around four to six years of age, as a child enters a school setting, the focus becomes one of ensuring that these processes occur covertly; i.e., an individual self-questions in order to regulate behaviour in accordance with a generated set of rules. Thus, one could suggest that language has executive properties which are necessary for the attainment of individual goals. If a goal is not met, it may reflect some form of deficit in linguistic competency.

**Developmental Disorders of Language**

Specific language impairment (SLI) includes a number of developmental disorders that are not due to mental handicap, hearing loss, motor deficits,
psychiatric illness, or severe environmental deprivation. However, the etiology of SLI is multifactorial and may include impairments in a number of cognitive processes including memory, auditory processing, sequencing, symbolic or representation processing, as well as encoding and decoding deficits (Stromswold, 2000).

Often, children with a developmental language disorder are initially indistinguishable from same-age peers. However, further examination may reveal that due to "an inability to communicate effectively through language or to use language as a basis for further learning" (without restriction on possible etiology), these children are often uncomfortable or act inappropriately in a social situation (Byers Brown & Edwards, 1989, p. 1). Byers Brown and Edwards suggest that the most common characteristics seen in children with a delay in language development include distress in a noisy environment, overactivity, immaturity and dependency, poor motor coordination, weak comprehension of humour, and difficulties initiating or maintaining conversation particularly with strangers. There are mild to significant deficits in both expressive and receptive language abilities. Vocabulary knowledge, syntax, and semantics are all affected. Speech articulation may be poor. Rourke (1994) has suggested that children with phonological deficits often fail to attend to novel materials presented orally.

Tallal and colleagues (Stark, Mellits, & Tallal, 1983; Stark, Tallal, & Mellits, 1985; Tallal, 1988) have distinguished between language-delayed children and
children with a severe language impairment (LI) and accompanying deficits in perceptual and motor skills. They suggest that a severe impairment is often associated with significant neurological deficits, such as atypical pattern of symmetry of the planum temporale (Semrud-Clikeman, Hynd, Novey, & Eliopoulos, 1991) whereas children with a language-delay have a maturational lag (a slower start to language development). LI children may be delayed in their ability to process "rapidly changing temporal cues" (Tallal, 1988, p. 163); They have difficulty processing and integrating information presented in rapid time sequences, whether it be motoric or sensory, especially if the processing and production of information must be done simultaneously. However, as highlighted by Montgomery, Windsor, and Stark (1991), there are only a small number of tests which adequately measure language impairment, most notably, pragmatic language skills and, therefore, these areas of functioning are not often addressed in neuropsychological and psychoeducational assessments. In addition, there are very few educational programs and schools designed to specifically assist children with language disorders even though they comprise 5-8% of primary school children (Beitchham, 1989), and often perform poorly on a wide variety of school-based tasks. Emphasis is placed, instead, upon assessment and assistance in specific academic domains, such as single word decoding and emergent skills in arithmetic.

Language development in children involves the attainment of a number of specific skills, including phonology (sound system of language), morphology (meaningful units of sound), semantics (meaning in language), and syntax
(language structure). Competency is initially reflected in the gestures of an infant, whether they are in response to an environmental event or occur outside of a specific action-reaction behaviour. As children develop, their language becomes vocal and audible. By the beginning of school (e.g., kindergarten), children are encouraged to internalize their thoughts and language.

Children who reveal a language impairment often have difficulties in a number of areas of linguistic processing, including receptive and expressive abilities. The following section examines the difficulties specifically seen in children who have been diagnosed with an attention deficit disorder.

**Developmental Disorders of Language in Children with an Attention Deficit Disorder**

Language is a culturally prescribed behaviour which is learned in, and operates on, one's environment. As such it is adaptive; it can accommodate novel situations and acquire new characteristics in an evolutionary manner. It also consists of speech routines or events, e.g., identification, greeting, farewell on a telephone. Each individual has to learn the conventions for carrying information through language, whether it be with gesture, facial expression, intonation, or stress, as well as lexical, syntactic, and phonological choices. Many factors contribute to linguistic performance and competence, including motivation, attention, understanding of the task, knowledge of words and difficulty, and complexity and novelty of a task (Simon, 1981).
Speech and language are intricately involved with other areas of development, such as symbolic play, peer relations, and academic performance. Adults increase the child's potential for communicative success through role-modeling. The child progresses from mother-child interactions to parentally-mediated child interactions with other adults and peers, to peer interactions that represent some status alignments. Children may experience more communicative success initially with adults because of the adult's controlling interactive style including frequent clarification requests, tags, and directive questions. They also require opportunities to participate in social interaction with peers to become competent communicators. Language impaired children make some, but not all of the predicted structural adjustments in interacting with different partners.

The study of pragmatics proposes that language is contextually variable, and that the child's speaker-behaviours vary as a function of major characteristics of the listener. It also addresses the ways in which context enters into the expression and understanding of language in a particular setting. Context includes the immediate physical environment, the verbal environment, and the social and psychological world in which the language user operates. Each individual relies on another's knowledge and recognition of procedures for entering into and sustaining a state of mutual involvement (including eye gaze), that is, "focused social interaction" (Ochs & Schieffelin, 1979, p. 3). Language users will adjust their speech behaviour according to whether or not their
interactional partners are gazing at them. This includes requests to notice, requests for confirmation of information, rhetorical questions, vocatives, repetitions, and increased pitch (see Appendix 4).

Pragmatics also involves that part of the world of objects and behaviours (verbal and nonverbal, situational and extrasituational, physical and social) which has significance for the language user and is relevant to competent verbal performance. Communication with children often breaks down because of gaps in their competence of pragmatics; a child may not take into awareness the listener's lack of awareness of an item under discussion. If the child has not yet developed a tense (verb) system, reference to events in the past, future, or imaginary world is difficult to achieve. In addition, the lower status of a child in interactions with an older child or an adult often results in unsuccessful bids for attention by young children who then begin to rely on interruptions which tend to be overridden and heard as irrelevant by older conversational partners.

The control of topics to be attended to is held by adults. Thus, as children begin to learn language they are also learning social structure; social status is linked to particular rights and obligations which are often manifested in verbal behaviour. Competence and performance in any language is, therefore, reliant on many factors including motivation, attention, understanding of the task, knowledge of words and difficulty, and complexity and novelty of a particular task. Language has social and cognitive aspects, it is representational (concrete and abstract) and it is communicative (exchange of information). Language
disorders in children encompass all areas of language including vocabulary, meaning, sentence structure, details of grammar, and the ability to use language in learning and in other forms of communication (Newcomer & Hammill, 1997). Receptive, expressive, and pragmatic skills may all be involved.

Not surprisingly, it has been suggested that children with delays or disorders of development in speech or language are "at risk" for both psychiatric and learning disorders. Problems in language are among the most common issues in referrals between the ages of 3 and 16 years, regardless of diagnosis (Toppleberg & Shapiro, 2000). Some studies have found that fifty percent of children presenting for first time evaluations to a community speech clinic have at least one diagnosable psychiatric disorder (Baker & Cantwell, 1982; Cantwell & Baker, 1980; Stevenson & Richman, 1978). Baker and Cantwell (1987b) found in their study of 300 children with speech/language disorders that 37% of the participants fit the criteria for an attention deficit disorder. It is widely accepted that 3% to 7% of the general population of elementary school children have an attention deficit disorder.

Cohen, Davine, Horodezky, and Lipsett (1993) found that 53 percent (210) of their total sample of 399 children referred to an outpatient psychiatric facility had a language impairment (previously identified or unsuspected), and that these children were often referred for service for externalizing problems including oppositional behaviour, hyperactivity, and aggression. The most frequently observed language problems were in the areas of receptive and expressive
syntax, receptive phonology, and auditory memory. Those least observed included expressive semantics (oral vocabulary) and expressive phonology (production of speech sounds). There were few problems with voice and dysfluency. In addition, the children with language impairment were rated significantly higher on the Hyperactive subscale of the Child Behaviour Checklist (Achenbach & Edelbrock, 1983). The authors suggested that "understanding the relation of language impairment and attention-deficit hyperactivity disorder is a challenge for future research ... at this time it is uncertain whether both are attributable to a common antecedent or whether there is a causal link between the two" (p. 600). As a point of interest, Ostrander, Weinfurt, Yarnold, and August (1998) have recently shown that the Attention Scale on the CBCL did not accurately identify the majority of participants in their study of 300 children with ADHD.

Giddan (1991) suggested that many of the language deficits seen in children with ADHD reflected pragmatic issues including rapid attention shifts, apparent obliviousness to situational cues, lack of awareness of social context, few pauses to assess body language, and infrequent use of facial cues to determine how other people feel. These children often interrupted others and ignored turn-taking rules. Giddan went on to further hypothesize that the subjects in her study lacked self-talk critical to the control and organization of their behaviour. These children would thus appear uncooperative, inattentive, and disruptive and would often be rejected by classmates because of issues based upon limited language skills. If a child lacks age-appropriate verbal
33

language skills s/he is more likely to act out physically; excessive and exaggerated levels of activity are one of the defining characteristics of an attention deficit disorder.

Love and Thompson (1988) found that the prevalence rate of the dual diagnosis of language disorder and ADHD was 48 percent, which was double the rate of children with ADHD alone and almost triple the rate for those children in their study with a language disorder alone. Fifty-six of seventy-five children with a diagnosis of language disorder also had a diagnosis of ADHD and nearly two-thirds (56 of 85) of the children with a diagnosis of ADHD also had a language disorder. ADHD was the behavioural disorder with the highest rate of occurrence across groups of children with speech problems only, with language problems only, and with both speech and language problems.

Beitchman and his colleagues (Beitchman, Hood, Rochon, Peterson, Montini, & Majumdar, 1989) suggest that the more general the language delay in children, the more likely there is an underlying neurodevelopmental immaturity (prefrontal cortex) which relates to a greater risk for an attention deficit disorder. Children with ADHD may experience some delay in the onset of talking. They are less verbal and dysfluent in situations where they must be organized and be able to generate speech.

Children with ADHD are also more likely to have difficulties in higher order, or executive, language functioning such as verbal mediation and guidance
of behaviour for planning and goal accomplishment. The development of self-controlled or self-regulatory behaviour is dependent upon the internalization of rule-governed language (Vygotsky, 1990) which requires adequate receptive and expressive language skills. Children need to comprehend the rules they hear in order to later retrieve, organize, and verbalize these rules. Children who are unable to understand or process language at an age-appropriate level may exhibit anxiety and confusion; this resultant confusion will often be expressed in some kind of disruptive behaviour. Brown and Edwards (1989) found that children with developmental language disorders show distress in a noisy or swiftly speaking environment through excessive restlessness or impulsivity, immature or dependent behaviour, and inappropriate speech. Conversations with children with ADHD are often difficult to maintain as these individuals may begin conversations with parents or peers at awkward moments, switch topics abruptly, interject unconnected thoughts, lose eye contact, miss conversational turns, and not adapt the message to the listener.

Rather than being viewed primarily as an issue involving language ability, and specifically pragmatic linguistic skill, ADHD is more often treated as a behavioural problem of inattentiveness. For these children, words are no longer tools with a meaning, which may effect a change in the environment. Typical complaints from peers, caregivers, and teachers include: s/he will interrupt when I'm dealing with another child; s/he is very rude; s/he always seems to miss the point; sarcasm goes completely over her/his head; s/he is unable to wait for her/his turn; and s/he never seems to do what s/he has been told. These
children have neither understood essential verbal, nonverbal, and situational cues, nor made decisions based on that evidence in accordance with social expectations. They will often switch topics abruptly, begin conversations with parents or peers at awkward moments, interject unconnected thoughts, lose eye contact, miss conversational turns, not adapt their message to the listener. Parents, peers, teachers, and caregivers become more directive and negative and less responsive during play and interactions which provides these children with "fewer opportunities to hear the high-level distancing language that encourages the development of representational skills necessary for the development of self-regulatory language" (Westby & Cutler, 1994 p. 63).

Tannock and her colleagues have been investigating the neuropsychological deficits and profiles of children with ADHD, and have recently suggested that there is a "high risk for misinterpretation of [a] child's failure to follow instructions [which] may result from impairment in language processing skills, rather than inattentiveness and/or oppositional behaviour" (1998, p. 2). The language of these children is less fluent and cohesive, especially when confronted with specific tasks such as generation of narratives. There is a delayed development in most facets of language, including self-talk and internalization of speech (Berk & Potts, 1991; Tannock & Schachar, 1996).

Overall, therefore, there is sufficient research to suggest that children with ADHD have difficulties in a number of linguistic processes, including receptive, expressive, and pragmatic language. In addition, the importance of
understanding the cognitive deficits in these children has been underscored in a number of recent studies. It appears no longer feasible to approach this disorder from the perspective of merely describing behavioural symptoms suggesting that a child is unable to “pay attention” or “sit still”. A more comprehensive approach to assessment and evaluation is necessary in order to understand neurological, cognitive, linguistic, and social functioning in children with an attention deficit disorder.

Social Competence in Children

A review of the literature suggests that social skills development makes it possible for a child to achieve three important goals:

1. initiate and develop positive social relationships with others;

2. facilitate an individual’s ability to cope effectively with the behavioural demands and expectations of specific settings; and

3. provide for the appropriate communication and assertion of one’s needs, desires, and preferences.

Social competence also plays an instrumental role in the successful negotiation of daily tasks, and because it usually involves speaking, it represents the functional use of language to achieve social goals. When children enter school they must adjust to the demands of the classroom setting. These demands may be expressed in the form of teacher requests, directives, and commands to work independently. As well, children are required to cooperate with others, listen carefully to the teacher’s instructions, make assistance needs
known, comply promptly with commands, respond to corrective teacher feedback, and display self-control (Walker, Schwarz, Nippold, Irvin, & Noell, 1994). With the possible exception of "work independently" and "display self-control", these tasks require age-appropriate receptive and expressive language skills (Chandler 1992). A child, upon entering school, must adjust to the behavioural requirements and social dynamics of free-play settings that are controlled by peers; i.e., they learn to initiate appropriately to peers and respond appropriately to others' initiations, assist others when the situation calls for it, interact with one or more peers for relatively long periods of time, play games at recess, communicate effectively, and cope with peer provocations.

**Social Competence in Children with an Attention Deficit Disorder**

Most reviews of social competency in children examine communication abilities, moral development, empathy for others, taking the perspective of others (theory of mind), and nonverbal communication skills (Bryan, 1991). Nieves (1991) has suggested that delays in verbal reasoning (as measured by the Verbal IQ on the Wechsler scales of intelligence) are highly correlated with disorders of conduct.

It has been shown that children with ADHD produce a greater number of negative verbalizations and physically aggressive acts. This behaviour pattern often leads to rejection and low acceptance by school-age peers. The children are unable to cope with the frustration of peer rejection which may lead to
attempts to exert physical control over other children. Specific skills deficits include difficulty with off-task behaviours, disruptive behaviours, immature or aggressive responding, difficulty with basic communication, and an overall difficulty in adapting behaviour to different situational demands (Hechtman, Weiss & Perlman, 1980). Overall, males have more problems with aggression and females have more problems with mood and emotion. Volitional or intentional disruptive behaviour confirms a co-morbid diagnosis of conduct disorder or oppositional defiant disorder. Children with ADHD are action oriented and the effects of their behaviour are primarily inadvertent and accidental. Barkley (1990) suggests that these children are "less likely to evaluate the social context when they enter a new group, to consider the social norms, or to wait for an appropriate invitation to enter" (p. 391). They appear socially awkward and immature and have trouble shifting social roles. Many of these children are unpopular and are actively rejected by school-age peers. Peer reactions may actually provoke or augment behavioural escalation.

Deficits in social skill development are related to the presence of a learning disability (Semrud-Clikeman & Hynd, 1991); emotional disturbance (Teeter & Semrud-Clikeman, 1997), and communication disorders (Bryan, 1991). As all of these difficulties have been found in particular samples of children with an attention deficit disorder, it is perhaps not surprising that so many of these children have difficulties such as low self-esteem, poor academic achievement, and perceived social unawareness. They seem unable to accurately perceive the disposition and intentions of others. They have poor affective or emotional
relationships with others. Izard (1991) has suggested that children with ADHD have difficulty labeling emotional states such as joy, anger, fear, and sadness, which may also suggest the presence of a delay in the development of language and/or vocabulary. It seems of paramount importance that appropriate social skills training programs be established; however, few programs exist in the local community or schools which specifically address the problems of the child with ADHD.

Whalen and Henker (1992) have proposed five aspects which are related to the interpersonal behaviour of children with ADHD: 1) response patterns of an increased rate of social contact; 2) style of response which reflects difficulties modulating affect and changing responses, including altering the timing of a response; 3) social information processing that relates to inaccurate appraisal of other's intentions and inappropriate attributions regarding the behaviour of others; 4) unpopularity with peers; and 5) the social impact of the child with ADHD on the social environment.

"The presence of prosocial behaviours, the capacity for psychological reflectivity, the ability to self-monitor, the ability to self-regulate, the capacity to identify and label affect, responsiveness to medication, and concurrent language and learning disabilities are all factors in the child that influence the family relationship" (Harris, 1995, p. 393). Unfortunately, the child with ADHD does not seem to be aware of the effect of one's behaviour on another individual. This, in turn, may result in other behaviour problems such as low self-esteem, mood
lability, low frustration tolerance, and temper outbursts. They are at risk for developing co-occurring disorders and, as well, the family relationship is at risk of being impacted upon.

**Summary**

Children are diagnosed with ADHD based upon the presence of a number of behavioural characteristics including difficulties with, but not exclusive to, attention. Problems with self-regulation and behavioural control are paramount and are often the impetus for referral of the child to a health practitioner. James (1898) initially defined *attention* as “the taking possession by the mind, in clear and vivid form, of one out what seem several simultaneously possible objects or trains of thought. Focalization, concentration, of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others” (p. 261-262). Children with ADHD often have difficulties with attention and concentration. One of the two subtypes of ADHD, *Inattentiveness*, reflects a preponderance of disturbances in the child based upon the inability to sustain, focus, select, or divide attention. However, other difficulties exist, including overactivity, impulsivity, and social maladaptiveness.

Researchers are now viewing ADHD as a cluster of symptoms. For example, Barkley (1997) has theorized that *behavioural inhibition* plays a central role in ADHD; a child has difficulty inhibiting a prepotent response as well as stopping an ongoing response. Furthermore, behavioural inhibition is closely
related to the effectiveness of four other processes including working memory, self-regulation of affect, the internalization of speech, and analysis/synthesis of an event (reconstitution).

This study specifically examines the possible presence of a deficit in language development in children with ADHD. Luria (1973) and Vygotsky (1960) have both hypothesized that speech activity (language) is a complex cognitive process comprising several different components including serving as a "special form of social communication ... a tool for intellectual activity ... (and) a method of regulating or organizing human mental processes (Luria, 1973, p. 307). The function of speech, therefore, is the regulation of all behaviour of both the individual and of another person. In their studies of adults with lesions in the frontal lobe, Luria and Vygotsky found that these patients had disturbances in regulatory behaviour.

Over the past 10 to 15 years, numerous lines of evidence exist suggestive of a biological origin to ADHD. Results from studies of EEG evoked response measures reveal changes in response amplitude which is believed to be related to prefrontal regions (Frank, Lazar, & Seiden, 1992). Cerebral blood flow to the prefrontal regions has been shown to be decreased (Lou, Henriksen, & Bruhn, 1984) and glucose metabolism is diminished in the left anterior frontal region (Zametkin et al., 1993). The genu of corpus callosum, which is involved in the interhemispheric transfer of information between the frontal lobes has been found
to be decreased in size, in a study of a small number of children with ADHD (Hynd et al., 1991).

Overall, there appears to be mounting evidence that ADHD is related, not to brain damage, but to abnormal brain development. Children with this disorder have a number of behavioural characteristics including overactivity, excessive talking, forgetfulness, inappropriate social and interpersonal interactions, and impulsivity. Luria and Vygotsky have suggested that language is the regulator of an individual's behaviour. It is reasonable, therefore, to examine the development of language in children with ADHD.

Language is comprised of three subtypes: receptive, expressive, and pragmatic. Children with ADHD exhibit a number of behaviours consistent with difficulties in all three areas. However, it is suggested that expressive language, which is the coding of internal speech into a general idea, motive, and finally an action, will be compromised more than receptive language (analysis of precise spoken sounds at the level of the temporal lobe). Specifically, it is hypothesized that:

1) Children with an attention deficit disorder will have weaker receptive language abilities than a normative group of same-aged children.

2) Children with an attention deficit disorder will have weaker expressive language abilities than a normative group of same-aged children;

3) Children with an attention deficit disorder will have weaker pragmatic language abilities than a normative group of same-aged children; and
4) Children with an attention deficit disorder will reveal stronger receptive language abilities than expressive skills, and stronger expressive skills than pragmatic language abilities, overall.
**METHOD**

**Sample**

Forty children between the ages of 6 to 10 years with a previously confirmed diagnosis of ADHD (according to DSM IV criteria) were sought through outpatient mental health clinics in the Greater Victoria District. Some of the children were referred to the mental health clinics for therapeutic intervention regarding maladaptive behaviour patterns, and the therapist approached the family regarding possible interest in participating in this research. Choosing not to participate in the study did not influence therapeutic intervention in any way. Other families sought inclusion in the study on their own initiative, having heard of the research through other participants.

Children were not excluded if they were taking a prescribed medication for control of ADHD, such as methylphenidate or dextroamphetamine, because this study was specifically interested in language abilities, rather than attention. There was no history of a co-morbid diagnosis such as conduct disorder or oppositional defiance disorder. All participants were English speaking with no hearing loss (as confirmed by pure tone audiometric screening conducted by the examiner prior to the assessment). A standardized measure of cognitive abilities (WISC-III) was used to include children with Performance IQ scores in the average range (85-115).
From the initial forty participants, three were excluded from the final analyses. One family withdrew permission due to personal/family reasons. Two other children had psychiatric evaluations in the community for review of medication dosage, following completion of their participation in the study, which suggested the possible presence of a Pervasive Developmental Disorder and/or Autism.

The final thirty-seven children included 12 girls and 25 boys, with an average age of 102.58 and 96.52 months, respectively. Ten of the twelve girls were taking a prescribed medication for control of hyperactivity, as were twenty-two of the boys (see Table #1). One of the participants (male) was being home-schooled and the rest of the sample was attending an educational setting on a full-time basis. No control group was used in this study. Rather, comparisons of scores were made to normative samples.

The children were assigned to two groups based upon their age; i.e., 6-8 years of age and 9-10 years of age. This discrimination was used as the tests of language development (see Instrumentation below) provide different versions based upon these same age categorizations. Thus, the study used a cross-sectional design rather than a longitudinal approach in which participants would be examined on a number of occasions across time. A cross-sectional design is the most commonly used research design in psychology (Shaughnessy & Zechmeister, 1994). It focuses on describing the characteristics of a particular
population or sample and does not permit, *per se*, conclusions regarding development of these same characteristics.

### Table 1. Clinical Sample Characteristics by Gender

<table>
<thead>
<tr>
<th></th>
<th>Girls</th>
<th>Boys</th>
<th>TOTAL</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>12</td>
<td>25</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>Age (months)</td>
<td>M = 102.58, S.D. = 19.341, Range = 77 to 127 months</td>
<td>M = 96.52, S.D. = 16.33, Range = 75 to 123 months</td>
<td>M = 98.514, S.D. = 17.33, Range = 75 to 127 months</td>
<td>.364**</td>
</tr>
<tr>
<td>Medication</td>
<td>10/12, 83.3 %</td>
<td>22/25, 88.0 %</td>
<td>32/37, 86.5 %</td>
<td></td>
</tr>
<tr>
<td>Performance IQ</td>
<td>M = 95.250, S.D. = 7.313</td>
<td>M = 100.240, S.D. = 7.939</td>
<td>M = 98.662, S.D. = 7.998</td>
<td>.075**</td>
</tr>
</tbody>
</table>

* an alpha level of .05 was used for all statistical tests
** NS - nonsignificant
Table 2. Clinical Sample Characteristics by Age Group

<table>
<thead>
<tr>
<th></th>
<th>72 - 107 mos</th>
<th>108 - 120 mos</th>
<th>TOTAL</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>24</td>
<td>13</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>7</td>
<td>5</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>17</td>
<td>8</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Performance IQ</td>
<td>M = 98.167</td>
<td>M = 99.462</td>
<td>M = 98.662</td>
<td>.633**</td>
</tr>
<tr>
<td></td>
<td>S.D. = 8.401</td>
<td>S.D. = 7.446</td>
<td>S.D. = 7.998</td>
<td></td>
</tr>
</tbody>
</table>

* an alpha level of .05 was used for all statistical tests
** NS - nonsignificant

Procedure

Each participant was seen on an individual basis for the evaluation, which required approximately three hours for completion, usually held over two sessions. The evaluations were held within the offices of a mental health centre or medical clinic. The questionnaires were completed by parents/caregivers on their own time and returned within a week of the assessment. Test administration and scoring were done exclusively by the author of the study. Upon completion of the study, results from ten children were randomly selected by the examiner for retabulation and rescoring. One subtest score was raised by
one mark, which did not affect the overall composite score. The following tests were administered in the same order for each child (see Instrumentation below for elaboration):

Table 3. Tests Administered

<table>
<thead>
<tr>
<th>TEST NAME</th>
<th>AREA OF INVESTIGATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wechsler Intelligence Scale for Children - 3rd Edition (WISC-III)</td>
<td>Cognitive Screening</td>
</tr>
<tr>
<td>Maico MA-17 Hearing Instrument</td>
<td>Pure Tone Hearing</td>
</tr>
<tr>
<td>Clinical Evaluation of Language Fundamentals - 3rd Edition (CELF-3)</td>
<td>Receptive and Expressive Language</td>
</tr>
<tr>
<td>Test of Language Development - P:3 and I:2 (TOLD-P:3 and TOLD-I:2)</td>
<td>Receptive and Expressive Language</td>
</tr>
<tr>
<td>Test of Pragmatic Language (TOPL)</td>
<td>Social/pragmatic Language</td>
</tr>
<tr>
<td>NEPSY Auditory Attention and Response Set</td>
<td>Sustained and Selective Attention</td>
</tr>
<tr>
<td>Child Behaviour Checklist (CBCL)</td>
<td>Externalizing and Internalizing Behaviours</td>
</tr>
<tr>
<td>Social Skills Rating System (SSRS)</td>
<td>Social Skills and Problem Behaviours</td>
</tr>
</tbody>
</table>

Following completion of the study, a two-page psychoeducational summary was prepared by the author and submitted to the parents/caregivers.
Additional consultation to school staff and medical/mental health personnel was provided upon request by the family. There were no financial costs to the family.

**Instrumentation**

Each of the following tests was administered on an individual basis.

1. The **Wechsler Intelligence Scale for Children - 3rd Edition** (WISC-III) (Wechsler, 1991) is the third edition of a standardized (norms collected on 2,200 cases residing in the United States of America) test of intelligence, first developed by David Wechsler in 1949. It is comprised of thirteen subtests which examine verbal and nonverbal reasoning in children ages 6 to 16 years 11 months of age. For this study, ten subtests were used; five for derivation of the Verbal Intelligence Quotient (VIQ) (Information, Similarities, Arithmetic, Vocabulary, Comprehension), and five for the Performance Intelligence Quotient (PIQ) (Picture Completion, Coding, Picture Arrangement, Block Design, Object Assembly). Scaled scores on each of these subtests were used to derive the Full Scale Intelligence Quotient (FSIQ), where a score between 85 and 115, inclusive, is considered to be within the average range. Each subtest follows a similar format; the examiner poses a question and the child is asked to respond; e.g., orally; by manipulating objects; or in a paper/pencil format. Questions may take the form of: "What colour is grass?"; "If you have two cookies and eat one, how many cookies do you have left?"; "What important thing is missing in the
picture?"; "Can you put these cards in order so they tell a story?"; and How are baseball and hockey alike?"

The WISC-III is one of the most commonly used measures for intelligence. Numerous studies have been conducted to establish the validity and reliability of this test. Concurrent and criterion validity have been found to be within the acceptable range. Internal consistency reliabilities are high (.90 and above).

This test was chosen rather than other accepted screening tasks such as the Kaufman Brief Intelligence Test (Kaurman & Kaufman, 1990) as it is less verbally biased.

2. Children who had not had a recent audiometric examination were screened for a possible hearing loss using a Maico MA - 17 hearing instrument, which was calibrated after every five subjects. This instrument measures pure tone perception from 125 to 8000. Each ear was tested separately, without masking. Hearing threshold was recorded in decibels.

3. The Clinical Evaluation of Language Fundamentals - 3rd Edition (CELF-3) (Semel, Wiig, & Secord, 1995) is a clinical tool used for the identification and evaluation of language deficits in children and adults ages 6 through 21 years of age. It has been standardized on 3,300 children, adolescents, and adults residing in the United States of America. Eight core subtests measure different aspects of language development including semantics (word meanings - e.g.,
vocabulary), syntax (word and sentence structure - e.g., verb tenses), and spoken language (memory - e.g., sentence recall). Individuals younger than 9 years of age are administered three subtests (Sentence Structure, Concepts and Directions, Word Classes) to derive the Receptive Language Score, and three other subtests (Word Structure, Formulated Sentences, Recalling Sentences) to compute an Expressive Language Score. Older children are evaluated using Semantic Relationships and Sentence Assembly rather than Sentence Structure and Word Structure, respectively. The supplementary tasks of Word Association, Listening to Paragraphs, and Rapid, Automatic Naming are not required to calculate the Receptive or Expressive Language Scores. A score between 85 and 115 is considered to be within the average range. Results were tabulated for Receptive and Expressive Composite Scores.

The language skills sampled by the CELF-3 are well documented in literature addressing language disorders and competency, which suggests satisfactory content validity. A number of studies using factor analysis and discriminant analysis have been completed in order to examine construct validity, and concurrent validity has been evaluated by comparing scores on the CELF-3 with others measures of language ability, including the WISC-III. All measures have been found to be within the acceptable range as stated by the authors of the test. Internal consistency reliability coefficients range from .65 to .91.

This test was chosen rather than other accepted measures of expressive (e.g., Expressive One-Word Picture Vocabulary Test - Revised) and receptive
(Peabody Picture Vocabulary Test - Revised) because it examines an individual's ability to work with single words, phrases, and complete sentences rather than focusing primarily on concrete nouns and class nouns.

4. The Test of Language Development - P:3 (TOLD-P:3) and Test of Language Development - I:2 (TOLD-I:2) (Newcomer & Hammill, 1997) were designed to measure children's expressive and receptive competencies through direct questioning of the child, rather than open-ended dialogue, keeping in mind the three main features of language of semantics, syntax, and phonology. Receptive abilities are measured with the subtests of Picture Vocabulary, Grammatic Understanding, and Word Discrimination. Oral Vocabulary, Grammatic Completion, and Word Articulation represent a child's expressive skills, and Relational Vocabulary, Sentence Imitation, and Phonemic Analysis comprise integrating-mediating abilities. The TOLD-P:3 was specifically designed for children 4 through 8 years 11 months. Older children are examined using the TOLD-P:2.

The authors of the tests demonstrate acceptable content and criterion-related, and construct validity. Internal consistency reliability coefficients range from .84 to .95 across the age groups.

5. The Test of Pragmatic Language (TOPL) (Phelps-Terasaki & Phelps-Gunn, 1992) provides a tool to examine the effectiveness and appropriateness of a child's pragmatic, or social, language skills. The items survey six core
components including physical setting, audience, topic, purpose, visual-gestural cues, and abstraction. Short vignettes (three to six sentences) are presented individually; each requiring a verbal/oral response to such questions as: “What do you think he really meant”, “What did Jill say to Tom”, What might this boy be saying to the doctor”. A single score is derived which reflects the number of correct responses. This score may be interpreted using a percentile rank, quotient, and/or age equivalent.

Criterion-related and construct validity of the TOPL have been found to be acceptable. Internal consistency reliability coefficients ranged from .74 to .89 from ages 5 through 13 (acceptable range) (see Limitations below).

6. The NEPSY (Korkman, Kirk, Kemp, 1998) is designed to assess neuropsychological development in preschool and school-age children (ages 3 through 12). It consists of a series of subtests that are used to assess: 1) attention/executive functions; 2) language; 3) sensori-motor functions; 4) visuo-spatial processing; and 5) memory and learning. Two subtests were used in this study to screen for attention; Auditory Attention and Response Set. These are described, by the authors, as “continuous performance tasks designed to assess the ability to be vigilant and to sustain selective auditory attention as well as the ability to shift and maintain a new and complex set involving both contrasting and matching responses” (p. 101). The test items are presented on an audiocassette and the participant is required to place a coloured square in a box.
in response to a particular target word. Scaled scores were derived from the raw score, with a score of 8 - 12 being considered in the average range.

The NEPSY was standardized on a sample of 1500 children residing in the continental United States of America. Test-retest reliability on Auditory Attention and Response Set was .81. The authors present evidence of content validity (expert review) and construct validity (correlations) within the acceptable range.

7. The Child Behaviour Checklist/4-18 (Achenbach, 1991) is a 112 item questionnaire, usually self-administered by the parent of caregiver of a child (ages 4 through 18 years), which examines behavioural competencies and difficulties. Separate scales include Withdrawn, Somatic Complaints, Anxious/Depressed, Social Problems, Thought Problems, Attention Problems, Delinquent Behaviour, and Aggressive Behaviour. Scores from the initial three scales and from the final two scales are grouped into two broad-band factors: Internalizing and Externalizing, respectively. Normal, borderline, and clinical ranges are established for the Scale Scores.

Test-retest reliabilities for each Scale Score, and internal consistency reliability coefficients are satisfactory, aside from a low Cronbach's alpha (.54 - .56) for Sex Problems in girls and boys ages 4-11 years of age. It should be noted that this subscale was not scored in this study as it is not required for computation of the Internalizing and Externalizing broad-band composites.
The CBCL was revised in 1991 to address issues of Content Validity. For example, *nonsport activities*, *allergy*, and *asthma* were omitted from the problem and competency scales. Construct and criterion related validity were found to be satisfactory.

8. The **Social Skills Rating System** (Gresham & Elliott, 1990) is a 93 item questionnaire, self-administered by the parent or caregiver of a child (preschool ages 3/4 through to grade 12), which provides an assessment of social behaviours that are felt to affect teacher-student relations, peer acceptance, and academic performance. The subscales of Cooperation, Assertion, Responsibility, Empathy (student self-report form only), and Self-Control, are used to derive a composite score of Social Skills. Problem behaviours are categorized as Externalizing Problems, Internalizing Problems, and Hyperactivity.

Internal consistency reliability coefficients range from .83 to .94 for Social Skills, and .73 to .88 for Problem Behaviours. Content and criterion-related validity are within the acceptable range.
RESULTS

1. Descriptive Sample Statistics

Initial descriptive statistics summarizing the sample scores on all measures are presented in Table 4. There were no missing data. The scores were contrasted with standardized means, as presented in the examiner's manual of each test. The mean score for the sample on the Performance IQ of the WISC-III was 98.622, which is within the average range (where a score of 100 is considered average). Overall measures of cognitive functioning were also within the average range (Full Scale IQ, WISC-III = 96.189). Inclusion in the study required that only the performance measures be within the average range. In addition, there were no significant differences on Performance IQ based upon gender or age group (72 to 107 months of age / 108 to 120 months of age) (see Table 1 and Table 2).

There were no significant differences on measures of attention between the normative standards and the children with ADHD (NEPSY Auditory Attention $t = -0.827, p < .414$; NEPSY Response Set $t = -0.400, p < .691$).
Table 4. Descriptive Statistics of Variable Scores for the Clinical Sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal IQ (WISC-III)</td>
<td>94.757</td>
<td>11.246</td>
<td>64 to 114</td>
</tr>
<tr>
<td>Performance IQ (WISC-III)</td>
<td>98.622</td>
<td>7.998</td>
<td>84 to 119</td>
</tr>
<tr>
<td>Full scale IQ (WISC-III)</td>
<td>96.189</td>
<td>8.860</td>
<td>75 to 115</td>
</tr>
<tr>
<td>Receptive Language Score (CELF-3)</td>
<td>99.216</td>
<td>11.914</td>
<td>57 to 120</td>
</tr>
<tr>
<td>Expressive Language Score (CELF-3)</td>
<td>83.324</td>
<td>14.870</td>
<td>50 to 108</td>
</tr>
<tr>
<td>Listening (TOLD)</td>
<td>94.514</td>
<td>10.67</td>
<td>71 to 118</td>
</tr>
<tr>
<td>Speaking (TOLD)</td>
<td>84.00</td>
<td>8.866</td>
<td>66 to 109</td>
</tr>
<tr>
<td>TOPL</td>
<td>81.514</td>
<td>8.153</td>
<td>63 to 100</td>
</tr>
<tr>
<td>Auditory Attention (NEPSY)</td>
<td>9.811</td>
<td>1.391</td>
<td>7 to 14</td>
</tr>
<tr>
<td>Response Set (NEPSY)</td>
<td>9.514</td>
<td>1.367</td>
<td>6 to 12</td>
</tr>
<tr>
<td>Internalizing Beh. (CBCL)</td>
<td>64.243</td>
<td>11.089</td>
<td>34 to 89</td>
</tr>
<tr>
<td>Externalizing Beh. (CBCL)</td>
<td>67.351</td>
<td>8.514</td>
<td>47 to 82</td>
</tr>
<tr>
<td>Social Skills (SSRS)</td>
<td>74.784</td>
<td>11.363</td>
<td>58 to 104</td>
</tr>
<tr>
<td>Problem Behaviour (SSRS)</td>
<td>127.351</td>
<td>10.662</td>
<td>100 to 145</td>
</tr>
</tbody>
</table>

In summary, all of the participants revealed Performance IQ's on the WISC-III within the average. There were no significant deficits on screening measures of sustained and selective auditory attention (NEPSY). The ratio of
boys to girls was 2:1; the usual occurrence reported in the literature is 3:1.
Thirty-two of the thirty-seven children were taking a stimulant medication.

2. Hypothesis Analysis

It was hypothesized that:

1) Children with an attention deficit disorder will have weaker receptive language abilities than a normative group of same-aged children;

2) Children with an attention deficit disorder will have weaker expressive language abilities than a normative group of same-aged children;

3) Children with an attention deficit disorder will have weaker pragmatic language abilities than a normative group of same-aged children; and

4) Children with an attention deficit disorder will reveal stronger receptive language abilities than expressive skills, and stronger expressive skills than pragmatic language abilities, overall.

All analyses were done using the SYSTAT computer program (Wilkinson & Hill, 1994). Due to the small sample size, univariate rather than multivariate analyses were used. Initially, however the Multivariate Multiple Regression was examined. If this was significant, i.e., $R^2$ was significant, then the univariate F tests were examined in order to determine which dependent variable was significant. Following this, separate one-way repeated-measures ANOVA were run, with specific contrast comparisons. Finally, preliminary analyses of the relationship between composite scores of Expressive and Receptive language
ability were examined. Zero-order correlations were examined between the Internalizing and Externalizing Scales of the Child Behaviour Checklist and the Social Skills and Problem Areas of the Social Skills Rating Scale before regression analyses using these same scales regressed upon CELF Receptive Language, CELF Expressive Language, TOLD Speaking, TOLD Listening, and TOPL.

2a. Hypothesis 1

Two separate measures of receptive language ability were used: 1) Receptive Language composite score of the CELF-3 and, 2) Listen composite score of the TOLD.¹

No significant differences were found using one-sample \( t \) tests between the children with ADHD and the normative sample on the Receptive Language composite score of the CELF-3, where \( M = 101.7, \ SD = 14.4 \), \( t (36) = -1.268, p = .213 \) (Table 5a). In addition, there were no significant differences in the Receptive Language composite score of the CELF-3 in children with ADHD based upon gender \( t (35) = 1.550, p = .130 \) (Table 5b). In fact, no significant gender differences were found on any comparisons and are therefore not discussed for Hypothesis 2, 3, or 4. No significant differences were found

¹ CELF-3 Receptive Language composite score is comprised of Concepts and Directions (execute oral commands), Word Classes (semantic classification) and Sentence Structure (word structure rules). TOLD Listen composite score includes Picture Vocabulary (semantics) and Grammatic Understanding (syntax).
between the children with ADHD and the normative sample on the TOLD Listen composite score, where \( M = 99.0, \ SD = 12.8, \ t(36) = 1.375, \ p = .221 \) (Table 5a).

Significant differences were found between the children with ADHD on the Receptive Language Composite Score of the CELF based upon Age Group. The younger group (ages 72 - 107 months) scored significantly higher, \( t(35) = 3.441, \ p = .002 \) than the older group, although, clinically, the score achieved by the older group (ages 108 - 120 months) would be interpreted as lying within the average range (i.e., 91.643 +/- 11.513) (Table 5c).

Similarly, significant differences were found between the children with ADHD on the Listen composite score of the TOLD based upon age group. The younger group (ages 72 - 107 months) scored significantly higher, \( t(35) = 3.441, \ p = .002 \) although, clinically, the score achieved by the older group (ages 108 - 120 months) would be interpreted as lying within the lower limits of the average range (i.e., 88.429 +/- 5.854) (Table 5c).

**Table 5a. Receptive Language Abilities**

<table>
<thead>
<tr>
<th></th>
<th>N = 37</th>
<th>Normative Sample</th>
<th>ADHD</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CELF Receptive Language</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>101.7</td>
<td>M = 99.216</td>
<td></td>
<td>.213</td>
</tr>
<tr>
<td>S.D.</td>
<td>14.4</td>
<td>S.D. = 11.914</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOLD Listen</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>99.0</td>
<td>M = 94.514</td>
<td></td>
<td>.221</td>
</tr>
<tr>
<td>S.D.</td>
<td>12.8</td>
<td>S.D. = 10.671</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5b. Receptive Language Abilities by Gender for the Clinical Sample

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th>Girls</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>CELF Receptive Language</td>
<td>M = 101.280 S.D. = 9.745</td>
<td>M = 94.917 S.D. = 15.084</td>
<td>.201</td>
</tr>
<tr>
<td>TOLD Listen</td>
<td>M = 95.440 S.D. = 2.147</td>
<td>M = 92.583 S.D. = 3.099</td>
<td>.454</td>
</tr>
</tbody>
</table>

Table 5c. Receptive Language Abilities by Age Group for the Clinical Sample

<table>
<thead>
<tr>
<th></th>
<th>72 - 107 mos.</th>
<th>108 - 120 mos.</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>CELF Receptive Language</td>
<td>M = 103.626 S.D. = 9.759</td>
<td>M = 91.643 S.D. = 11.513</td>
<td>.003</td>
</tr>
<tr>
<td>TOLD Listen</td>
<td>M = 98.217 S.D. = 11.322</td>
<td>M = 88.429 S.D. = 5.854</td>
<td>.005</td>
</tr>
</tbody>
</table>

Overall, the group of children with ADHD did not differ significantly on the two measures of receptive language ability. There was no gender difference in receptive language abilities in the ADHD group. However, there was a significant effect of age. On both measures of receptive language ability, i.e., CELF Receptive language composite score and TOLD Listen composite score,
the older group of children had significantly lower scores. Clinically, however, these scores are interpreted as lying within the average range.

2b. Hypothesis 2

Two separate measures of expressive language ability were used: 1) Expressive Language composite score of the CELF-3 and, 2) Speaking composite score of the TOLD.²

Significant differences were found between the children with ADHD and the normative sample on the Expressive Language composite score of the CELF-3, where $M = 101.2$, $SD = 14.7$, $t (36) = -7.312$, $p = .000$) (Table 6a).

Significant differences were found between the children with ADHD and the normative sample on the TOLD Speaking composite score, where $M = 97.6$, $SD =14.3$, $t (36) = -10.977$, $p = .000$) (Table 6a). Significant differences were also found between the children with ADHD on the Expressive Language Composite Score of the CELF based upon age group. The younger group (ages

² CELF-3 Expressive Language composite score is comprised of Word Structure (knowledge of word structure rule), Formulated Sentences (creation of simple and compound sentences) and Recalling Sentences (recite sentences). TOLD Listen composite score includes Oral Vocabulary (semantics) and Grammatic Completion (syntax).
72 – 107 months) scored significantly higher \( t(35) = 3.662, \ p = .001 \). In contrast to the receptive language measures, the score achieved by the older group (ages 108 - 120 months) would be interpreted clinically as falling below the average range (i.e., \( M = 73.429, \ SD = 13.821 \)) (Table 6b).

No significant differences were found between the children with ADHD on the Speaking composite score of the TOLD based upon age group. However, clinically, the younger group scored within the average range, and the mean score of the older group was below the average range. (Table 6c).

**Table 6a. Expressive Language Abilities**

<table>
<thead>
<tr>
<th>N = 37</th>
<th>Normative Sample</th>
<th>ADHD</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CELF Expressive</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Language</td>
<td>M = 101.7</td>
<td>M = 83.324</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S.D. = 14.4</td>
<td>S.D. = 14.870</td>
</tr>
<tr>
<td></td>
<td>TOLD Speaking</td>
<td>M = 97.6</td>
<td>M = 84.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S.D. = 14.3</td>
<td>S.D. = 8.866</td>
</tr>
</tbody>
</table>
Table 6b. Expressive Language Abilities by Age Group for the Clinical Sample

<table>
<thead>
<tr>
<th></th>
<th>72 - 107 mos.</th>
<th>108 - 120 mos.</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>CELF Expressive Language</td>
<td>M = 89.348</td>
<td>M = 73.429</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>S.D. = 12.194</td>
<td>S.D. = 13.821</td>
<td></td>
</tr>
<tr>
<td>TOLD Speaking</td>
<td>M = 85.522</td>
<td>M = 81.500</td>
<td>.185</td>
</tr>
<tr>
<td></td>
<td>S.D. = 8.468</td>
<td>S.D. = 9.274</td>
<td></td>
</tr>
</tbody>
</table>

Overall, the group of children with ADHD obtained significantly lower scores on the two measures of expressive language ability. There was no gender difference in expressive language abilities. However, there was a significant effect of age on the CELF Expressive Language composite score, with the older group scoring significantly lower. On the TOLD Speaking test, there was no difference between the two age groups. However, clinically, the interpretation of the older group's score would indicate that this measure is below the average range.

The children with ADHD performed below the average range on three expressive language subtests of the CELF - 3 when compared to normative samples. These tasks examined generative language as related to planning and producing sentences for conversation, classroom discourse, and written language. The tasks required formulation of novel sentences to either an open-
ended prompt (CELF - 3 Formulated Sentences - use a given word in a sentence while describing a picture, \( t (36) = -10.162, p = .000 \), or with already established words given in an nonmeaningful order (CELF- 3 Sentence Assembly - "go" "the" "store" "to" "please", \( t (36) = -8.761, p = .000 \)). In addition, the children with ADHD revealed significant deficits on a test of sentence recall (CELF 3 Recalling Sentences - "repeat exactly what I say", \( t (36) = -5.415, p = .000 \)). No significant delays were found on subtests measuring syntax, the ability to follow directions, association of related words, and interpretation of sentences that involve comparative relations, spatial relations, temporal relations, sequential relations, and passive relations (Table 6c).

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Normative Sample</th>
<th>ADHD</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formulated Sentences</td>
<td>M = 10.2</td>
<td>M = 6.486</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>S.D. = 2.9</td>
<td>S.D. = 2.103</td>
<td></td>
</tr>
<tr>
<td>Sentence Assembly</td>
<td>M = 10.3</td>
<td>M = 5.615</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>S.D. = 3.0</td>
<td>S.D. = 1.805</td>
<td></td>
</tr>
<tr>
<td>Recalling Sentences</td>
<td>M = 10.1</td>
<td>M = 7.811</td>
<td>.016</td>
</tr>
<tr>
<td></td>
<td>S.D. = 2.8</td>
<td>S.D. = 2.459</td>
<td></td>
</tr>
<tr>
<td>Concepts and Directions</td>
<td>M = 10.2</td>
<td>M = 9.784</td>
<td>.547</td>
</tr>
<tr>
<td></td>
<td>S.D. = 2.8</td>
<td>S.D. = 2.162</td>
<td></td>
</tr>
<tr>
<td>Word Classes</td>
<td>M = 10.4</td>
<td>M = 9.378</td>
<td>.067</td>
</tr>
<tr>
<td></td>
<td>S.D. = 2.7</td>
<td>S.D. = 2.005</td>
<td></td>
</tr>
</tbody>
</table>
2c. Hypothesis 3

One measure of pragmatic language ability was used, i.e., the Test of Pragmatic Language.

A significant difference was found between the children with ADHD and the normative sample on the TOPL where $M = 100$, $SD = 15.0$, $t (36) = -13.792$, $p = .000$ (Table 7a).

No significant differences were found between the children with ADHD based upon age group, $t (35) = .921$, $p = .364$). Both age groups performed below the average range (Table 7b).

<table>
<thead>
<tr>
<th>Table 7a. Pragmatic Language Abilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 37</td>
</tr>
<tr>
<td>Normative Sample</td>
</tr>
<tr>
<td>ADHD</td>
</tr>
<tr>
<td>p</td>
</tr>
<tr>
<td>Test of Pragmatic Language</td>
</tr>
<tr>
<td>M = 100</td>
</tr>
<tr>
<td>S.D. = 15.0</td>
</tr>
<tr>
<td>M = 81.514</td>
</tr>
<tr>
<td>S.D. = 8.153</td>
</tr>
<tr>
<td>.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 7b. Receptive Language Abilities by Age Group for the Clinical Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>72 - 107 mos.</td>
</tr>
<tr>
<td>108 - 120 mos.</td>
</tr>
<tr>
<td>p</td>
</tr>
<tr>
<td>Test of Pragmatic Language</td>
</tr>
<tr>
<td>M = 82.478</td>
</tr>
<tr>
<td>S.D. = 8.612</td>
</tr>
<tr>
<td>M = 79.929</td>
</tr>
<tr>
<td>S.D. = 7.364</td>
</tr>
<tr>
<td>.364</td>
</tr>
</tbody>
</table>
Overall, the group of children with ADHD obtained significantly lower scores on the measure of pragmatic language ability. There were no significance differences based upon gender or age group. No comparison measures on the other tests of language ability were available. The CELF - 3 and TOLD do not specifically address issues of pragmatic language or language in a social context.

Additional analyses using one-sample $t$ tests revealed no significant differences between normative measures and children with an ADHD on tests of semantics (TOLD Semantics), syntax (TOLD Syntax), and organization/integration (TOLD Organizing). Thus, children with ADHD all performed within the average range on these measures.

2d. Hypothesis 4

It was predicted that there would be a hierarchical order of linguistic ability in children with ADHD; namely that pragmatic skills would be the most delayed with more well-developed expressive skills, and the least difficulty in receptive abilities (Table 8a & b).
Table 8a. Composite Standard Score Means and Standard Deviations for CELF and TOPL by Gender and by Age Group for the Clinical Sample

<table>
<thead>
<tr>
<th></th>
<th>CELF Receptive Language</th>
<th>CELF Expressive Language</th>
<th>TOPL Pragmatic Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Group N = 37</td>
<td>M = 99.216</td>
<td>M = 83.324</td>
<td>M = 81.514</td>
</tr>
<tr>
<td>Boys</td>
<td>M = 101.280</td>
<td>M = 84.040</td>
<td>M = 81.840</td>
</tr>
<tr>
<td>Girls</td>
<td>M = 94.917</td>
<td>M = 81.833</td>
<td>M = 80.833</td>
</tr>
<tr>
<td>72 - 107 months</td>
<td>M = 103.826</td>
<td>M = 89.348</td>
<td>M = 82.478</td>
</tr>
<tr>
<td>108 - 120 months</td>
<td>M = 91.643</td>
<td>M = 73.429</td>
<td>M = 79.929</td>
</tr>
</tbody>
</table>

Table 8b. Composite Standard Score Means and Standard Deviations for TOLD Listen and TOLD Speaking by Gender and by Age Group for the Clinical Sample

<table>
<thead>
<tr>
<th></th>
<th>TOLD Listen</th>
<th>TOLD Speaking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Group N = 37</td>
<td>M = 94.514</td>
<td>M = 84.000</td>
</tr>
<tr>
<td></td>
<td>S.D. = 10.671</td>
<td>S.D. = 8.866</td>
</tr>
<tr>
<td>Boys</td>
<td>M = 95.440</td>
<td>M = 84.520</td>
</tr>
<tr>
<td></td>
<td>S.D. = 11.019</td>
<td>S.D. = 9.363</td>
</tr>
</tbody>
</table>
Initial analyses were completed using the CELF Receptive Language composite, the CELF Expressive Language composite, and the Test of Pragmatic Language. Supplementary analyses included TOLD Listen and TOLD Speaking.

Separate one-way repeated-measures ANOVAs testing indicated a significant difference between CELF Receptive Language (CELFRLA) and CELF Expressive Language (CELFELA) $F(2,18) = 2.367$, $p = .038$, with higher scores on measures of receptive language. No significant effects of gender were found ($F(1,35) = 1.177$, $p = .287$) but significant effects of age were shown ($F(1,35) = 16.366$, $p < .000$). The older group of children with ADHD had significantly lower scores on the measures of expressive language.

<table>
<thead>
<tr>
<th>Table 8b. cont'd</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Girls</strong></td>
<td><strong>M = 92.583</strong></td>
<td><strong>M = 82.917</strong></td>
</tr>
<tr>
<td></td>
<td><strong>S.D. = 10.086</strong></td>
<td><strong>S.D. = 7.267</strong></td>
</tr>
<tr>
<td><strong>72 - months</strong></td>
<td><strong>M = 98.292</strong></td>
<td><strong>M = 85.250</strong></td>
</tr>
<tr>
<td></td>
<td><strong>S.D. = 11.079</strong></td>
<td><strong>S.D. = 8.389</strong></td>
</tr>
<tr>
<td><strong>108 - months</strong></td>
<td><strong>M = 87.538</strong></td>
<td><strong>M = 81.692</strong></td>
</tr>
<tr>
<td></td>
<td><strong>S.D. = 5.010</strong></td>
<td><strong>S.D. = 9.595</strong></td>
</tr>
</tbody>
</table>
Similar results were found on comparisons of CELFRLA (receptive) and Told Speaking (expressive) ($F(2,16) = 5.771, p < .000$). There was no effect of gender ($F(1,35) = 1.692, p = .202$) but there was a significant effect of age ($F(1,35) = 8.133, p = .007$). Thus, the differences between measures of expressive and receptive language ability did not vary as a function of the child's gender. However, there were significant differences based upon age group between receptive and expressive language composite scores with the younger group of children with ADHD having significantly higher scores than the older group.

Separate one-way repeated-measures ANOVAs testing indicated no significant difference between CELF Receptive Language and TOPL (pragmatic language) ($F(1,21) = 1.552, p = .193$) or between CELF Expressive Language and TOPL ($F(1,21) = 1.002, p = .509$).

The results were not significant when the composite scores of the TOLD were examined using one-way repeated-measures ANOVAs. There was no significant difference between TOLD Listen (receptive) and TOLD Speaking (expressive) ($F(1,16) = 1.413, p = .230$). There were no significant effects of gender between the two measures of language ($F(1,35) = .643, p = .424$), but the older group had significantly lower scores on both language measures ($F= 8.542, p = .006$).
Examining three measures of language, CELFELA (expressive), CELFRLA (receptive), and TOPL (pragmatic), there were no significant differences by gender ($F(1,35) = .843, p = .365$) on multivariate repeated measures analysis followed by contrast analysis. Thus, averaged over these three measures of language, there was no significant difference between the genders. However, using the same three measures, there were significant differences based upon age group ($F(1,35) = 12.210, p = .001$) with the older group having significantly lower scores. However, there was no age group difference in the differences (i.e., the differences in the age groups were similar across the two ages and did not differ in direction) ($F(1,35) = .966, p = .333$). Repeated-measures contrast analysis indicated an age group difference in the difference on CELF Expressive Language composite and the Test of Pragmatic Language, $F(1,35) = 12.003, p = .001$. There was an age group difference in the difference between the measure of expressive language and that of pragmatic language. The younger group performed more poorly on the TOPL in comparison with the CELF Expressive Language test. The older group of children with ADHD performed more poorly on the CELF Expressive Language measure with higher scores on the TOPL.

Univariate repeated-measures testing indicated a significant difference overall between TOLD Listen and CELF Receptive Language composite, $F(1,16) = 3.043, p = .010$. There was a significant effect for age group ($F(1,35) = 14.794, p = .000$) with the older group of children with ADHD having significantly lower scores (but still within the average range on a clinical scale).
Univariate repeated-measures testing also indicated a significant difference overall between TOLD Speaking and CELF Expressive Language composite (F(1,16) = 3.098, p = .009). However, there were no significant effects of gender or age group on the two measures of expressive language.

In addition, univariate repeated-measures testing indicated no significant difference between the TOPL and TOLD Listen, or the TOPL and TOLD Speaking. The scores on the test of social/pragmatic language did not differ significantly from measures of expressive language (F(1,21) = 1.005, p = .506) or receptive language (F(1,21) = 1.390, p = .259).

Across all five measures of language investigated in this study, no effect of gender was found. However, significant effects for age were shown on two measures of receptive language (CELF Receptive Language and TOLD Listen) and one measure of expressive language (CELF Expressive Language) (Table 9). In all instances of significant difference, the older group of children had lower scores than the younger group.
Table 9. Analysis of Variance Significance for Composite Standard Score by Age and Gender for the Clinical Sample

<table>
<thead>
<tr>
<th></th>
<th>Age Group</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>CELFRLA</td>
<td>p&lt; .002 **</td>
<td>p&lt; .201 *</td>
</tr>
<tr>
<td>CELFE LA</td>
<td>p&lt; .001 **</td>
<td>p&lt; .679 *</td>
</tr>
<tr>
<td>TOPL</td>
<td>p&lt; .364 *</td>
<td>p&lt; .730 *</td>
</tr>
<tr>
<td>TOLD Listen</td>
<td>p&lt; .001 **</td>
<td>p&lt; .454 *</td>
</tr>
<tr>
<td>TOLD Speak</td>
<td>p&lt; .249 *</td>
<td>p&lt; .578 *</td>
</tr>
</tbody>
</table>

* ns
** sig (.05)

Social Competency

Subsequent analyses were run to examine relationships between language functioning and social behaviours. No a prior hypotheses had been set, so the investigations were exploratory in nature. However, it is known that acceptable social conduct or behaviour is predicated on the knowledge of the future. It seems reasonable to suggest that children with ADHD will show deficiencies in areas of social skill. Barkley (1997) believes that "(t)he problem, then, for those with ADHD is not one of knowing what to do, but one of doing what they know when it would be most adaptive to do so" (p. 244) (italics in original text). Children with ADHD have a difficult time constructing rules as well as using rules over a period of time. Internalized speech (expressive language)
together with working memory give the child the ability to understand and comply with a set of rules. It is suggested, therefore, that deficits in expressive language scores would be correlated with deficits on measures of Externalizing Behaviours on the CBCL (e.g., argues, lies, threatens, screams) and Problems Behaviours on the SSRS (e.g., fights with others, disobeys rules, has temper tantrums), i.e., behaviours that break rules and may be judged by others as reflecting an impulsivity. This is in contrast to Internalizing Behaviours such as preferring to be alone and shyness. Bloomquist, August, Cohen, Doyle, & Everhart (1997) found that children with ADHD were able to identify problem components, and generate solutions but had difficulty anticipating consequences and were more aggressive in choosing a “best solution” compared to a control group of same-age children.

Zero order correlations were run to look for multicollinearity in the data set, and then multiple regression analyses were run. Four measures of social functioning were used: 1) CBCL Internalizing Behaviours; 2) CBCL Externalizing Behaviours; 3) SSRS Social Skills; and 4) SSRS Problem Behaviours. Three measures of language ability were used: 1) CELF Receptive Language

1CBCL (Child Behaviour Checklist) Internalizing Behaviours is the composite score derived from the subscales of Withdrawn, Somatic Complaints, Anxious/Depressed.
CBCL Externalizing Behaviours is the composite score derived from the subscales of Delinquent Behaviour, Aggressive Behaviour.
SSRS (Social Skills Rating System) Social Skills is the composite score derived from the subscales of Cooperation, Assertiveness, Responsibility, Self-Control.
SSRS Problem Behaviours is the composite score derived from the subscales of Externalizing, Internalizing, Hyperactivity.
composite; 2) CELF Expressive Language composite; and 3) the Test of Pragmatic Language. Each of the measures of social functioning were regressed individually on the measures of language ability.
Table 10. Correlation Coefficients between all Measures for the Clinical Sample

<table>
<thead>
<tr>
<th></th>
<th>VIQ</th>
<th>PIQ</th>
<th>FS</th>
<th>CRL</th>
<th>CEL</th>
<th>TLIS</th>
<th>TSP</th>
<th>TOPL</th>
<th>NAA</th>
<th>NAR</th>
<th>SSK</th>
<th>SPR</th>
<th>INT</th>
<th>EXT</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIQ</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIQ</td>
<td>0.402</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FS</td>
<td>0.903*</td>
<td>0.755*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRL</td>
<td>0.700*</td>
<td>0.351</td>
<td>0.662*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEL</td>
<td>0.627*</td>
<td>0.244</td>
<td>0.569*</td>
<td>0.666*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TLIS</td>
<td>0.581*</td>
<td>0.013</td>
<td>0.416</td>
<td>0.626*</td>
<td>0.561*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TSP</td>
<td>0.658*</td>
<td>0.437</td>
<td>0.680*</td>
<td>0.655*</td>
<td>0.571*</td>
<td>0.275</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOPL</td>
<td>0.529*</td>
<td>0.343</td>
<td>0.529*</td>
<td>0.485*</td>
<td>0.488*</td>
<td>0.579*</td>
<td>0.416</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NAA</td>
<td>0.228</td>
<td>0.181</td>
<td>0.237</td>
<td>0.125</td>
<td>0.217</td>
<td>0.141</td>
<td>0.05</td>
<td>0.170</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NAR</td>
<td>0.225</td>
<td>0.242</td>
<td>0.265</td>
<td>0.232</td>
<td>0.395</td>
<td>0.159</td>
<td>0.282</td>
<td>0.227</td>
<td>0.681</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSK</td>
<td>0.004</td>
<td>0.055</td>
<td>0.018</td>
<td>0.239</td>
<td>0.128</td>
<td>0.157</td>
<td>0.167</td>
<td>0.163</td>
<td>0.094</td>
<td>0.131</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPR</td>
<td>-0.09</td>
<td>-0.02</td>
<td>-0.07</td>
<td>-0.27</td>
<td>-0.38</td>
<td>-0.07</td>
<td>-0.26</td>
<td>0.036</td>
<td>0.058</td>
<td>-0.5*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>-0.13</td>
<td>0.037</td>
<td>-0.07</td>
<td>-0.31</td>
<td>-0.28</td>
<td>0.003</td>
<td>-0.14</td>
<td>-0.03</td>
<td>0.059</td>
<td>-0.36</td>
<td>0.546*</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXT</td>
<td>-0.09</td>
<td>-0.13</td>
<td>-0.12</td>
<td>-0.18</td>
<td>-0.12</td>
<td>-0.24</td>
<td>-0.15</td>
<td>-0.14</td>
<td>0.063</td>
<td>-0.5*</td>
<td>0.726*</td>
<td>0.571*</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

* significant .01

VIQ – Verbal IQ – WISC-III
PIQ – Performance IQ – WISC-III
FS – Full Scale IQ – WISC-III
CRL – Receptive Language Score – CELF-3
CEL – Expressive Language Score – CELF-3
TLIS – Listen Score – TOLD
TSP – Speaking Score – TOLD
TOPL – Test of Pragmatic Language
NAA – Auditory Attention - NEPSY
NAR – Auditory Response - NEPSY
SSK – Social Skills - SSRS
SPR – Problem Behaviours - SSRS
INT – Internalizing Behaviours - CBCL
EXT – Externalizing Behaviours - CBCL
No multicollinearity was found (see Table 10) in that none of the variables were very highly correlated, aside from the a correlation of .90 between VIQ and FSIQ, which is not unexpected as FSIQ is derived, in part, from VIQ. A cutoff criteria of .90 was used in accordance with Tabachnick and Fidell (1996). Multiple regression was chosen as it can be applied to data in which the variables are correlated with one another to varying degrees and, as well, to continuous variables. Analysis was performed using SYSTAT Regression for a Standard Multiple Regression. No variables were transformed; there was no significant skewness in the data, nor a significant number of outliers.

Table 11a through 11e display the correlations between the variables, the unstandardized regression coefficients (B) and the standardized regression coefficients (2).

Table 11a. Standard Multiple Regression of CELF Receptive Language on Measures of Social Competency

<table>
<thead>
<tr>
<th>Variables</th>
<th>RL</th>
<th>EL</th>
<th>INT</th>
<th>EXT</th>
<th>SSK</th>
<th>SPR</th>
<th>B</th>
<th>2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT</td>
<td>-.31</td>
<td>-.40</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td>6.49</td>
<td>.268</td>
<td>.176</td>
</tr>
<tr>
<td>EXT</td>
<td>-.18</td>
<td>-.12</td>
<td>.57</td>
<td>1.0</td>
<td></td>
<td></td>
<td>.605</td>
<td>.025</td>
<td>.902</td>
</tr>
<tr>
<td>SSK</td>
<td>.239</td>
<td>.128</td>
<td>-.36</td>
<td>-.49</td>
<td>1.0</td>
<td></td>
<td>-.65</td>
<td>-.02</td>
<td>.915</td>
</tr>
<tr>
<td>SPR</td>
<td>-.27</td>
<td>-.22</td>
<td>.546</td>
<td>.726</td>
<td>-.53</td>
<td>1.0</td>
<td>3.16</td>
<td>.074</td>
<td>.679</td>
</tr>
</tbody>
</table>
### Table 11b. Standard Multiple Regression of CELF Expressive Language on Measures of Social Competency

<table>
<thead>
<tr>
<th>Variables</th>
<th>RL</th>
<th>EL</th>
<th>INT</th>
<th>EXT</th>
<th>SSK</th>
<th>SPR</th>
<th>B</th>
<th>2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT</td>
<td>-.31</td>
<td>-.40</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td>10.6</td>
<td>.35</td>
<td>.07*</td>
</tr>
<tr>
<td>EXT</td>
<td>-.18</td>
<td>-.12</td>
<td>.57</td>
<td>1.0</td>
<td></td>
<td></td>
<td>.22</td>
<td>.007</td>
<td>.97</td>
</tr>
<tr>
<td>SSK</td>
<td>.239</td>
<td>.128</td>
<td>-.36</td>
<td>-.49</td>
<td>1.0</td>
<td></td>
<td>-9.4</td>
<td>-.22</td>
<td>.21</td>
</tr>
<tr>
<td>SPR</td>
<td>-.27</td>
<td>-.22</td>
<td>.546</td>
<td>.726</td>
<td>-.53</td>
<td>1.0</td>
<td>3.39</td>
<td>.063</td>
<td>.71</td>
</tr>
</tbody>
</table>

### Table 11c. Standard Multiple Regression of TOLD Speaking on Measures of Social Competency

<table>
<thead>
<tr>
<th>Variables</th>
<th>RL</th>
<th>EL</th>
<th>INT</th>
<th>EXT</th>
<th>SSK</th>
<th>SPR</th>
<th>B</th>
<th>2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT</td>
<td>-.31</td>
<td>-.40</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td>-2.5</td>
<td>-.14</td>
<td>.483</td>
</tr>
<tr>
<td>EXT</td>
<td>-.18</td>
<td>-.12</td>
<td>.57</td>
<td>1.0</td>
<td></td>
<td></td>
<td>.186</td>
<td>.010</td>
<td>.961</td>
</tr>
<tr>
<td>SSK</td>
<td>.239</td>
<td>.128</td>
<td>-.36</td>
<td>-.49</td>
<td>1.0</td>
<td></td>
<td>-.37</td>
<td>-.01</td>
<td>.937</td>
</tr>
<tr>
<td>SPR</td>
<td>-.27</td>
<td>-.22</td>
<td>.546</td>
<td>.726</td>
<td>-.53</td>
<td>1.0</td>
<td>4.33</td>
<td>.13</td>
<td>.462</td>
</tr>
</tbody>
</table>

### Table 11d. Standard Multiple Regression of TOLD Listening on Measures of Social Competency

<table>
<thead>
<tr>
<th>Variables</th>
<th>RL</th>
<th>EL</th>
<th>INT</th>
<th>EXT</th>
<th>SSK</th>
<th>SPR</th>
<th>B</th>
<th>2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT</td>
<td>-.31</td>
<td>-.40</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td>5.64</td>
<td>.26</td>
<td>.176</td>
</tr>
<tr>
<td>EXT</td>
<td>-.18</td>
<td>-.12</td>
<td>.57</td>
<td>1.0</td>
<td></td>
<td></td>
<td>-.51</td>
<td>-.02</td>
<td>.905</td>
</tr>
<tr>
<td>SSK</td>
<td>.239</td>
<td>.128</td>
<td>-.36</td>
<td>-.49</td>
<td>1.0</td>
<td></td>
<td>-.53</td>
<td>-.02</td>
<td>.921</td>
</tr>
<tr>
<td>SPR</td>
<td>-.27</td>
<td>-.22</td>
<td>.546</td>
<td>.726</td>
<td>-.53</td>
<td>1.0</td>
<td>9.39</td>
<td>.244</td>
<td>.162</td>
</tr>
</tbody>
</table>
Table 11e. Standard Multiple Regression of TOPL on Measures of Social Competency

<table>
<thead>
<tr>
<th>Variables</th>
<th>RL</th>
<th>EL</th>
<th>INT</th>
<th>EXT</th>
<th>SSK</th>
<th>SPR</th>
<th>B</th>
<th>2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT</td>
<td>-.31</td>
<td>-.40</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td>-.56</td>
<td>-.03</td>
<td>.864</td>
</tr>
<tr>
<td>EXT</td>
<td>-.18</td>
<td>-.12</td>
<td>.57</td>
<td>1.0</td>
<td></td>
<td></td>
<td>.502</td>
<td>.030</td>
<td>.882</td>
</tr>
<tr>
<td>SSK</td>
<td>.239</td>
<td>.128</td>
<td>-.36</td>
<td>-.49</td>
<td>1.0</td>
<td></td>
<td>.469</td>
<td>.020</td>
<td>.912</td>
</tr>
<tr>
<td>SPR</td>
<td>-.27</td>
<td>-.22</td>
<td>.546</td>
<td>.726</td>
<td>-.53</td>
<td>1.0</td>
<td>8.44</td>
<td>.287</td>
<td>.114</td>
</tr>
</tbody>
</table>

Internalizing behaviours were significantly related to Expressive Language composite score ($p < .07$) on the CELFELA, but not on the TOLD Speaking. There was only a small and insignificant trend toward Receptive Language abilities to be related to Internalizing behaviours on both measures of receptive language; i.e., CELFRLA ($p < .17$) and TOLD Listening ($p < .16$). There was no significant relationship to Pragmatic language skills ($p < .864$).

None of the other measures of social competency (i.e., SSRS Social Skills, SSRS Problem Behaviours) were related to language abilities. Overall clinically, however, the children with ADHD performed significantly below the average range on measures of social skills (co-operation, assertion, responsibility, and self-control) ($M = 74.784$, $SD = 11.363$ with a standardized score of 100), as seen on the SSRS, and significantly above the average range
on reported problem behaviours on the SSRS (acting out, aggression) (M = 127.351, S.D. = 10.662).
DISCUSSION

Children with an attention deficit disorder exhibit a number of difficulties in day-to-day tasks which may affect their ability to be accepted in family, community/social, and academic settings. It has been suggested that approximately 10 percent of the school population has been diagnosed with this disorder (Barkley, 1997), but some researchers have noted that 25 percent of children in elementary school classrooms are being treated with a stimulant medication (Lyon, 1994). The DSM-IV describes two subtypes of ADHD; inattentive type and hyperactive/impulsive type. These distinctions are based upon observations of behavioural phenomenology, and do not reflect measured cognitive deficits.

Much of the current research is focused on establishing an etiology for this disorder. Magnetic resonance imaging (MRI) studies of boys with ADHD, aged 5 to 18 years, have revealed a 4.7% smaller total cerebral volume with a number of significantly smaller structures on the right side of the brain (e.g., right globus pallidus, right caudate nucleus, right anterior frontal region) (Castellanos et al., 1996). Additional support comes from MRI studies which have shown low volumes regions of the corpus callosum, most notably the splenial area (Semrud-Clikeman et al., 1994). These findings suggest a dysfunction of right-sided prefrontal-striatal systems (Swanson, Castellanos, Murias, LaHoste, & Kennedy, 1999).
LaHoste et al. (1996) suggest that a polymorphic variation in the gene encoding the D4 dopamine receptor may be involved in ADHD. The dopamine D4 receptor is distributed in cortical and limbic systems of the brain. The stimulant medications prescribed to children with ADHD inhibit the dopamine transporter (including methylphenidate, amphetamine, pemoline, and bupropion, Cook et al., 1995).

Barkley (1997) recently published his comprehensive theory of ADHD which specifically examines executive functioning in children with this disorder. He suggests that ADHD is not a disorder of attention, per se, but reflects a multidimensional processing problem including deficits in verbal and nonverbal working memory and internalization of language which lead to difficulties in behavioural inhibition and self-regulation. Karatekin and Asarnow (1998) have also reported deficits in verbal and spatial working memory. Long-term memory deficits have not been found in children with ADHD (Kaplan, Dewey, Crawford, & Fisher, 1998).

The role of memory and language in behavioural control was previously presented by Luria and Vygotsky. They highlighted the importance of language formation as it occurs in social development. Speech, they felt, becomes the mechanism for regulating and organizing mental processes.
This study was designed to examine differences in receptive, expressive, and pragmatic language ability in children with and without an attention deficit disorder. It was hypothesized that children with ADHD would reveal significant delays in all facets of linguistic skill, especially pragmatic language. This, in turn, would directly impact upon measured, demonstrated, and self-perceived social competency.

Overall, the clinical sample did not reveal deficits on general measures of cognitive screening, including verbal reasoning, and visual-spatial processing. However, studies of morphology have implicated the role of the right hemisphere in ADHD. Therefore, general screening measures of visual-spatial processing (e.g., Performance IQ of the Wechsler scales) may not be adequate in discerning possible deficits in right hemisphere functioning.

In addition, no significant deficits on measures of sustained and selective auditory attention were found (NEPSY Auditory Attention and Response Set). The tests used in this study were short tasks of continuous performance. A review of the individual data revealed that one participant (male) performed below the average range on the task of sustained attention, and three children (2 males, 1 female) performed below the average range on the test of selective attention (two of these participants were not taking a stimulant medication, and one was being referred to a psychiatrist for review of dosage). Thus, in this clinical sample, there were no significant deficits seen on measures of auditory attention, lending support to the notion that ADHD is not exclusively a disorder of
inattentiveness, or that, in this sample, medication is effective in controlling deficits in selective and/or sustained attention. Further studies of children who are not taking a stimulant medication at the time of testing are strongly warranted.

Overall, there were no deficits on two composite measures of Receptive Language. These composite scores included subscales which measured syntax, attending to directions, and word relationships (semantics). In addition, there was no significant difference in the scores of boys and girls. However, the older group (ages 108 - 120 months) had significantly lower scores on these measures (although the average for the older group was within the average range, clinically).

However, a number of significant differences did emerge between the normative sample and the children with ADHD on measures of language functioning. The children with ADHD revealed significant deficits on measures of expressive language and as well, on a single measure of pragmatic language. Yet, the hypothesis could not be supported that there is a hierarchical pattern to the deficits seen in a clinical population with ADHD. There was no significant difference between the scores on measures of expressive language and pragmatic language. It had been hypothesized that the children with ADHD would reveal the lowest scores on the test of pragmatic language (see Limitations for further discussion of the TOPL). Possible interpretations include: 1) children with ADHD reveal similar deficits on measures of expressive and
pragmatic language; 2) pragmatic language functioning cannot be viewed separately from other processes of linguistic functioning; and 3) the current measure does not validly represent the construct of pragmatic language.

Additionally, results from the TOPL may not be generalizable to predictions regarding community-, home-, and school-based behaviours that children with ADHD may display. It is not difficult to imagine that many children (with or without an attention deficit disorder) are able to respond appropriately to oral questions regarding cultural expectations and social norms. However, further research is required to determine if children with ADHD may be effective when required to carry out prescribed actions. For example, one participant in this study responded that he should apologize for his mistakes and never hurt anyone else. However, the child went on to state that he had a difficult time doing what he was supposed to do, so when someone made him angry he hit back, and then tried to hide because he knew he “would get into trouble”. His score on the TOPL was within the average range, but he had been expelled from two schools, and suspended from another setting due to “behaviour problems”.

There were no differences between boys and girls on measures of linguistic functioning or social competency. However, significant differences were found between the younger (ages 72 - 107 months) and older (108 - 120 months) of children. The older children performed significantly more poorly on the language tasks. This suggests that these children may have a delay in the development of language that, without intervention, increases in magnitude.
These children fall further behind same-aged peers. This implication highlights the importance of further longitudinal studies to identify patterns of language development, particularly in older adolescents. It also underscores this author's point of view that preliminary assessment and evaluation of children with ADHD must include assessment of language competency.

It is important to note that there are inherent difficulties in making conclusions regarding the significance of actual test scores when investigating neuropsychological functioning in a clinical sample. Issues arise around what is statistically significant and what is clinically relevant. All of the tests used in this study are well-standardized with norms based upon large sample sizes. As was seen in this study, in some cases the difference in scores between two groups, whether it be clinical versus normative sample, boys versus girls, or younger group versus older group may not have been statistically significant, yet clinical interpretation would place the scores as falling below the average range, and therefore significant for diagnosis and therapeutic intervention.

Upon conclusion of this study, exploratory analyses were carried out to examine the relationship between linguistic competency and social-emotional development. The presence of expressive language difficulties was significantly related to the endorsement of internalizing behaviours by parents on the CBCL. There was no significant relationship to externalizing behaviours. Thus, children in the study who performed most poorly on measures of expressive language,
had elevated scores on items indicating sadness, worry, fearfulness, and loneliness.

The importance of this study is twofold: 1) it adds to the growing body of literature regarding specific deficits in children with an attention deficit disorder; and 2) it provides information regarding intervention and therapeutic techniques. A review of recent literature regarding treatment methods emphasizes the importance of medication trials as well as short-term interventions which are primarily symptomatic in focus. Currently, there is little support to suggest that long-term therapies are effective (Satterfield, Satterfield, & Schell, 1987). Specific approaches include parent counseling and training, classroom intervention such as antecedent-based (prevention of symptoms such as reducing homework, posting rules, peer tutoring) and consequent-based implementations (positive reinforcement contingency paradigms and response cost contingencies). Unfortunately, little empirical research is available to evaluate the effectiveness of these modifications with children with ADHD. There is little information available regarding interventions that focus on the cognitive and language-based difficulties of children with ADHD. For example, as noted above, research has found that, often, these children are unable to accurately judge time and temporal relationships. In addition, they have difficulty encoding and tagging the emotional context of a situation. Yet, there appear to be no reports which specifically address interventions regarding these issues.
Teeter and Semrud-Clikeman (1997) suggest that early identification and intervention are most effective if implemented in the preschool years. In addition, Tallal (1988) states that outcomes are better for children with expressive language problems who do not display evidence of receptive language delay. In this study, the children with ADHD were found to have significant deficits on measures of expressive language with average receptive skills. In addition, these deficits appeared to worsen over time as evidenced by poorer scores on the older group of children. Early identification of those children with symptoms suggestive of an attention deficit disorder, along with comprehensive assessment of cognitive abilities, including language development, is necessary, rather than relying on surveys of behavioural symptoms which may be inconsistent from one setting to the next, or from one respondent to another. There is no evidence to suggest that children with ADHD “outgrow the disorder”. If, indeed, ADHD is a cluster of symptoms indicative of abnormal/delayed cortical development then it is important to understand all of the underlying effects. In addition, if one accepts the suggestions of Luria, Vygotsky and, more recently, Barkley, that language is related to behavioural regulation, then it becomes even more urgent to examine closely the development of receptive, expressive, and pragmatic language abilities.

Cognitive-behavioural therapies treating children with ADHD have not yet been shown to be effective in lessening the core symptoms (Barkley, 1997). One of the most common approaches has been what could be described as the Stop-Listen-Think method. Children are encouraged to define a problem, generate a
variety of alternative solutions, evaluate the ideas and choose the best one or negotiate a compromise, and create a plan to implement the solution. One can only anticipate the number of difficulties a child with ADHD would have implementing this approach to problem-solving, especially with known deficits in expressive language abilities. Each step requires an understanding of complex tasks which, in turn, demand oral or written responses that are creative, novel, logical, sequential - i.e., intricate and elaborate processes of expressive language.

In addition, some research addressing the socio-emotional functioning of children with language disabilities, has revealed a significant elevation in the number of internalizing disorders, including depression, as rated by parents (Nussbaum, Bigler, & Koch, 1986). In the current study, expressive language deficits were shown to be significantly related to internalizing behaviours on the CBCL, with a trend toward a relationship with receptive language.

Overall, the extent to which ADHD and language-based difficulties are associated with learning problems, poor achievement, and socio-emotional difficulties requires further study. Results from this study suggest that children with this disorder have significant delays in the development of expressive and pragmatic language abilities which, if left untreated, may continue to worsen over time. Further studies need to follow the development of language in children with ADHD over a number of years to clarify these results.
In addition, children with ADHD are prone to the development of maladaptive coping strategies as reflect in increased internalizing behaviours. Current morphological research has indicated possible predispositions to this disorder including genetic influences and cortical deficiencies at the level of tissue development (e.g., corpus callosum) and neurotransmission (e.g., dopamine and serotonin).

Short-term interventions, which focus on medication trials and contingency-based paradigms help alleviate some of the core symptoms, including hyperactivity and non-compliance, but no long-term benefits have been shown. It is only through the discovery and understanding of the cognitive and linguistic abilities and profiles of children with ADHD that comprehensive management of this disorder can be offered.

**Limitations**

No control group was created for this study, instead normative data on well-standardized tests was used for comparison. Future research which includes other contrasting groups, such as children with a learning disability and no evidence of an attention deficit disorder, is important.

In addition, the children in this study were previously diagnosed with ADHD by a member of the medical community, including child psychiatrists and
paediatricians. None of the participants received a diagnosis of attention deficit disorder, inattentive subtype. No verification of the diagnosis could be made. Although no child with a co-morbid diagnosis (e.g., Oppositional Defiant Disorder, Conduct Disorder, Pervasive Developmental Disorder, Autism) was included in the study, no confirmation could be made that these other disorders did not exist. However, clinical impressions and test results indicated that no co-morbidities existed.

The majority of the children were taking a stimulant medication. Analyses were not done to examine differences in linguistic performance of children with and without medication due to the small sample size of children not taking a medication (5/37).

Another possible limitation to the study was the small sample size. Three participants were excluded from the final analyses, leaving a total of 37 subjects. Of these children, over 50 percent had been referred to a mental health clinic for therapeutic intervention. Thus, the sample may include only children who display the most disruptive patterns of behaviour, and may not accurately reflect characteristics seen in other children with ADHD. In addition, the sample included 25 boys and 12 girls. Demographic studies most often report a ratio of 3:1 (males to females). The girls in this study may have had more challenging behaviours (e.g., acting out, aggression) than are seen in other females with this disorder.
Screening for a specific learning disability (e.g., reading comprehension) was not carried out; it is not known how many of the children had difficulties in areas of academic achievement which may, in turn, impact upon their ability to develop linguistic processes. It must also be noted that developmental delays in language may affect academic achievement.

Two measures each of both receptive and expressive language ability were used. Only one measure of pragmatic language was available. In establishing the concurrent validity of the TOPL, the authors suggest that "concurrent validity is derived by correlating a test with other established measures dealing with similar constructs, in this case pragmatic language. The correlational evidence supporting the test's validity was collected by asking teachers to rate the pragmatic language skills of 30 students who were given the TOPL." Results from TOPL have not been correlated with other objective measures of pragmatic language and the author of this study is unaware of other tests which specifically examine this area of linguistic functioning. It is difficult, therefore, to determine if the TOPL exclusively measures pragmatic language. It would not be surprising if it was also correlated with measures of spoken language (expressive language), verbal reasoning, and general cognitive abilities. The correlation coefficient between the TOPL and the Language subtest of the Screening Children for Related Early Education Needs (SCREEN) (Hresko, Reid, Hammill, Ginsburg, & Baroody, 1988) is .70; between the Mathematics, Writing, and Reading subtests are .32, .39, and .55, respectively, and between the TOPL and Scholastic Aptitude Scale (Bryant & Newcomer,
It is therefore difficult to make conclusions regarding the development of pragmatic language in children with ADHD as few tests exist to measure pragmatic language and it is unclear if the TOPL is a valid indicator of development of social language.

The CELF-3 was used to examine Receptive and Expressive Language abilities. Six subtests were administered to each child, however, depending upon the age of the child a different set of subtests was chosen. For example, children 6-8 years of age complete Sentence Structure (Receptive Language) and Word Structure (Expressive Language) whereas for those individuals between the ages of 9 and 21 years of age these tasks are substituted by Semantic Relationships (Receptive Language) and Sentence Assembly (Expressive Language), respectively. Sentence Structure measures the child’s ability to process and interpret spoken sentences and Word Structure assesses a child’s acquisition of English morphological rules (i.e., syntactic roles of words). The older child is required to complete items which examine the ability to interpret different semantic relationships in sentences (Semantic Relationships) and to assemble syntactic structures into acceptable sentences (Sentence Assembly). No information is provided in the Technical Manual for the CELF-3 to suggest that the two different subtests of Receptive Language and Expressive Language are equivalent in nature. Therefore further, investigations are required to discern if the decline in scores in the older population reflects a difference in tests or language ability, per se.
Similar issues should be raised concerning the equivalence of tests for both forms of the Test of Language Development, i.e., Primary and Intermediate versions. These issues of between-form reliability and validity are not discussed in the Examiner's Manual.

**Future research**

Most often it is assumed that our knowledge is reflected in our verbal behaviour (the verbal bias); children with ADHD must be offered ways to improve upon their verbal skills and thus, perceived competency. Future research must continue to explore potential etiologies of an attention deficit disorder, and to further examine the validity of subtyping this disorder (as is seen in the DSM-IV). Such studies may also help to provide a neuropsychological profile of cognitive abilities, as current diagnosis relies on behavioural phenomenology which is, most often, subjective and therefore highly variable from situation-to-situation and from individual-to-individual. Specifically, a wider selection of qualitative measures of pragmatic and social/contextual language functioning would be an important addition to the tests already available.

Further investigations should also examine the possible preponderance of internalizing behaviours, such as anxiety, withdrawal in children with ADHD. Not surprisingly, it is the children who present with externalizing behaviours (acting out, aggression) who are first noticed by school staff and caregivers, and therefore may receive the most immediate attention. It appears that the
emotional difficulties these children have may be related to feelings of sadness and worry, or feelings of worthlessness, as well as the deficits in self-regulation. Co-morbid diagnoses most often include Oppositional Defiant Disorder and Conduct Disorder. Keeping in mind the suggested role of dopamine and serotonin in this clinical syndrome, and the established role of these neurotransmitters in depression, it becomes necessary to investigate and document other possible co-morbidities. This may, in turn, have far reaching implications for medication trials.

This study did not examine differences in language ability in children with ADHD who had also been diagnosed with a specific learning disability such as a reading disability or language impairment (e.g., SLI - Specific Language Impairment or LD - Language Disorder). A brief survey of the Means and Standard Deviations of CELF-3 Subtest and Composite Standard Scores for Children and Adolescents with Language Disorders (LD) and Without Language Disorders (Non-LD), as presented in the Technical Manual for the CELF-3, reveals that the mean scores achieved by the participants on the Expressive Language subtests were similar to those individuals who had been identified with an LD. Further investigation is required.

In addition, the CELF-3 has been shown to correctly classify at least 70% of children surveyed as the presence or absence of a language disorder. No research has yet been provided which examines classification rates of children with and without ADHD based upon tests of language ability.
Finally, future research must focus on suitable interventions for children with ADHD. One is struck by comments from caregivers that "having a fridge covered with stickers" does not seem to be an effective way to help these children. By recognizing and clarifying the core symptoms of this disorder, further progress can be made toward providing suitable assistance.
LITERATURE REVIEW AND REFERENCES


Halperin, J.M., Sharma, V., Siever, L.J., Schwartz, S.T., Matier, K., Wornell, G.,


families of nonproblem children and ADHD children with higher and lower levels of oppositional-defiant behaviour. Journal of Abnormal Child Psychology, 24, 85-104.


behaviour disorders. Language, Speech, and Hearing Services in
Schools, 23, 214-223.

McGee, R., & Share, D.L. (1988). Attention deficit disorder hyperactivity and
academic failure: Which comes first and what should be treated? Journal
of the American Academy of Child and Adolescent Psychiatry, 26, 711-
716.

environmental, and developmental characteristics of 7 yr. old children
with stable behaviour problems. Journal of Child Psychology and
Psychiatry, 25, 573-586.

with teacher-identified problems of attention. Journal of the American
Academy of Child and Adolescent Psychiatry, 27, 318-325.

Disorders, 14(3), 29-54.

language disorders. In J.E. Obrzut, & G.W. Hynd (Eds.),
Neuropsychological foundations of learning disabilities: A handbook of
issues, methods, and practice (pp. 573-601). San Diego, CA: Harcourt
Brace Javanovich.

National Institutes of Health (NIH), (1998). Diagnosis and treatment of attention
deficit hyperactivity disorder (ADHD). NIH Consensus Statements.
statement.htm.

Austin, Texas: Pro-Ed.

In J.E. Obrzut, & G.W. Hynd (Eds.), Neuropsychological foundations
of learning disabilities: A handbook of issues, methods, and practice

assessment, and intervention. Topics in Language Disorders, 14(3),
1-12.

Academic Press.


Appendix I

DSM IV DIAGNOSTIC CRITERIA FOR ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (Diagnostic and Statistical Manual - IV (American Psychiatric Association, 1994))

A. Either (1) or (2):

(1) six (or more) of the following symptoms of inattention have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Inattention
(a) often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities
(b) often has 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 schoolwork, chores, or duties in the workplace (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 6 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 adolescents or
adults, may be limited to subjective feelings of restlessness)
(d) often has 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 7 years

C. Some impairment from the symptoms is present in two or more settings (e.g., at school (or work) 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 exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder and are not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder).
Appendix 2

COMMUNICATIVE COMPETENCE (Simon, 1981)

COMPETENT FEATURES

<table>
<thead>
<tr>
<th>FORM</th>
<th>FUNCTION</th>
<th>STYLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>flexible, precise vocabulary</td>
<td>sustains topic of conversation</td>
<td>considers listener's informational needs</td>
</tr>
<tr>
<td>mastery of syntactic and morphological rules</td>
<td>selected phrasing reflects communicative intent</td>
<td>advance planning of content</td>
</tr>
<tr>
<td>complexity and variety of syntax</td>
<td>gives support for a point of view</td>
<td>finds words easily to express thoughts</td>
</tr>
<tr>
<td>mastery of tense</td>
<td>social and cognitive uses of language</td>
<td>intelligible, distinct speech</td>
</tr>
<tr>
<td>mastery of irregular grammatical features</td>
<td>uses elaborated and restricted codes</td>
<td>fluency in expression</td>
</tr>
<tr>
<td>uses clear noun referents</td>
<td>developed heuristic language function</td>
<td>comfortable speech rate</td>
</tr>
<tr>
<td>uses subordinates to relate ideas</td>
<td>contextual adaptations of language modifies and clarifies message upon listener request</td>
<td>audible speech</td>
</tr>
</tbody>
</table>
**Appendix 3**

COMMUNICATIVE COMPETENCE (Simon, 1981)

**INCOMPETENT FEATURES**

<table>
<thead>
<tr>
<th>FORM</th>
<th>FUNCTION</th>
<th>STYLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>limited vocabulary repeated often</td>
<td>wanders from conversational topic</td>
<td>egocentric comments</td>
</tr>
<tr>
<td>syntactic and morphological errors</td>
<td>ineffective illocutionary speech acts</td>
<td>incoherent sequencing of details</td>
</tr>
<tr>
<td>basic syntactic patterns re-used</td>
<td>opinions stated as fact</td>
<td>word-finding difficulty</td>
</tr>
<tr>
<td>difficulty with irregular verbs</td>
<td>relies upon restricted code language</td>
<td>false starts in speech</td>
</tr>
<tr>
<td>lacks consistency in tense and number reference</td>
<td>informal social uses of language</td>
<td>slurred speech</td>
</tr>
<tr>
<td>uses ambiguous pronouns</td>
<td>afraid to ask adults questions</td>
<td>rapid, jerky speech rate</td>
</tr>
<tr>
<td>unsystematic combination of ideas</td>
<td>limited language flexibility</td>
<td>speech volume not adapted to context</td>
</tr>
<tr>
<td></td>
<td>tactless statements</td>
<td></td>
</tr>
<tr>
<td></td>
<td>restates same information</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 4

STAGES IN THE ACQUISITION OF PRAGMATICS
(Reed, 1986, p. 294)

<table>
<thead>
<tr>
<th>0 - 9 mo.</th>
<th>9 - 18 mo.</th>
<th>18 - 24 mo.</th>
<th>24 - 36 mo.</th>
<th>&gt; 36 mo.</th>
<th>Adulthood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perlocution</td>
<td>Functions</td>
<td>Functions</td>
<td>Functions</td>
<td>Functions</td>
<td>Functions</td>
</tr>
<tr>
<td>gazing, crying, touching, smiling, vocalizations, grasping, sucking, laughing</td>
<td>instrumental regulatory interactional personal heuristic imaginative informative</td>
<td>pragmatic interpersonal textual ideational</td>
<td>responds to queries</td>
<td>sustains topic</td>
<td>attend to quality -</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>rapid topic change</td>
<td>systematic changes in speech</td>
<td>informative true</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>indirectives and hints</td>
<td>relevant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>role-playing</td>
<td>avoid ambiguity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>assume other's perspective</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>metalinguistic</td>
<td></td>
</tr>
<tr>
<td>Illocution</td>
<td>Intentions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nonverbal giving pointing showing</td>
<td>label response request greet protest repeat describe attend</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Turn-Taking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 5

CONSENT FORM

February 14, 1999

Dear Parent or Guardian,

My name is Jody Bain, and I am a graduate student in Psychology at the University of Victoria, as well as a sessional faculty member in the Department of Psychology at Camosun College and the University of Victoria. My area of research is the study of behaviours in children, with an emphasis on children who have difficulty "paying attention". This research is performed as a partial fulfilment of the requirements for my Ph.D. degree in Developmental Neuropsychology. Your name has been provided to me by the Ministry for Children and Families, Royal Oak office, as your child has been referred to this centre for services.

It has long been suggested that children with an attention deficit disorder do not have the ability to focus or maintain their attention. However, these children are noted to be very attentive to a number of events in their environment. Being able to attend is the ability to be aware, and these children have an awareness of many things to the point that they may be thought of as being overly aware of each and every item around them (e.g., sensitivity to noise, grabbing at objects, inability to leave something alone). Rather than viewing these children as being inattentive, I am interested in understanding how they use language as a communication tool in order to organise and control behaviours. In order to do this, I have put together a battery of tests that examines a child's problem-solving abilities, expressive and receptive language skills, and understanding of the social nature of language (pragmatic language). In addition, there are two questionnaires, to be completed by yourself, which examine socio-emotional development.

Completion of the test battery by your child will require approximately three hours; this may be divided into two or three sessions. The initial battery is a series of nine subtests which examine overall problem-solving abilities. The nature of the tasks includes: assembling puzzles, defining words, oral arithmetic computation, answering questions of general knowledge such as "What is the colour of grass?", and describing pictures (e.g., "What is missing in this picture?"). The tests of language development specifically examine how well a child uses words in everyday conversation. Your child will be asked to name everyday objects, repeat short sentences, generate one sentence to describe each in a series of pictures, and complete sentences which are missing one word (e.g., Paula has a bicycle. The bicycle is ______ (hers)). Each of the subtests requires three to eight minutes for completion. Answers will be recorded verbatim and scored later. Credit is given for a correct response, but for many items, partial credit may also be given for an
incomplete answer. Each specific test has been standardised and examined for its reliability and validity.

The inventories which are completed by yourself examine the child's adaptive behaviours. They require less than an hour to complete (this may be done at home). The questions survey everyday behaviours such as "Does your child speak in an appropriate tone of voice at home?"

Participation is completely voluntary on the part of your child, and the child may choose to withdraw from the study at any time, with no consequences. All data collected will be confidential and will be used for research purposes only. Results of the study will be published as my doctoral dissertation. Numbers will be used for coding, rather than the name of a child. Scored data will be reviewed by myself and members of my graduate committee (Drs. M. Joschko, N. Galambos, M. Hunter (Department of Psychology) and Dr. A. Pence (Department of Child and Youth Care). No information that would permit identification of individual participants will be used (e.g., no initials or personal history). Consent forms for participation will be stored separately and will be destroyed after completion of the study.

If you have any questions or require further information, please contact me at 721-7525. You may also contact Dr. M. Joschko, my graduate supervisor, at 477-1826 (Queen Alexandra Centre for Children's Health). Thank you for your interest in this study. Please complete the attached consent for participation.

Jody Bain, M.A.
Ph.D. Candidate (University of Victoria)
Appendix 6

EXAMINER’S SCRIPT FOR CHILD PARTICIPANTS

Thank you for coming to see me today. I have talked to ___________ (parent/caregiver) and they have told me that they are interested in finding out how well you can listen and answer questions for me. I would like to have you do some puzzles, look at some of my pictures, and tell me some stories.

Do you have any trouble with your school work? (most kids say “no”) Are you able to read and do math? (most kids say “yes”) That’s great.

I would now like to ask you some more questions now. Before we go on, we will be taking a break around _________ (time) but if you want to stop, for any reason, before than time you just let me know.

Are you ready to go on and answers some more questions?

The first thing I would like you to do is to print your name for me.....