

The Reading Comprehension Abilities of Children with ADHD

Stephen E. Brock
University of California, Davis

CHAPTER I

Attention-Deficit/Hyperactivity Disorder (ADHD) is a diagnostic category found in the *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition) (DSM IV) published by the American Psychiatric Association (1994). According to Barkley (1990) ADHD is a ". . . diagnostic label for children presenting with significant problems with attention, impulse control, and over activity" (p. 3). Most of the research to date has suggested ADHD children to have their greatest difficulty with tasks that require *sustained attention* (Douglas, 1983). However, there is some current debate regarding the possibility there may be a separate type of ADHD that has *focused attention* as a primary symptom (Barkley, 1990).

Although descriptions of this disorder are not new, a tremendous amount of recent research energy has been expended investigating this disorder. For example, it was estimated that between the years 1957 to 1960 only 31 articles were published on what was then called "hyperkinetic impulse disorder." However, by 1980 almost 3,000 articles had been published (Weiss & Hechtman, 1979, 1986). Further, Barkley (1990) suggests that ". . . this figure has surely doubled in the past ten years" (p. 39).

The current research has its origins in that portion of the literature dealing with the reading achievement of children with ADHD. While previous research has suggested that this disorder has no measurable impact on the development of word reading abilities (Wood & Felton, 1994), the effect of ADHD on reading comprehension has yet to be carefully studied. Thus, this study will examine the reading comprehension abilities of children with ADHD. Perhaps the most important question addressed by this research is whether the presence of this disorder creates special reading instructional needs.

Before discussing the proposed research and reviewing the literature this introduction will separately examine conceptualizations of attention deficit disorders and the process of reading comprehension. This will be done to give the reader a understanding of the disorder and reading skill being studied.

Conceptualizations of ADHD

Although the symptoms now regarded as reflecting ADHD have been recognized for almost a century, the ways in which this condition have been viewed has been subject to numerous re-conceptualizations (Frick & Lahey, 1991; Goodman & Poillion, 1992). These changes are documented in several revisions of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) (American Psychiatric Association, 1968, 1980, 1987, 1994) which contain diagnostic categories for children with ADHD symptoms. These revisions document the evolving nature of our understanding of this condition. The section that follows will examine this changing understanding by exploring previous and current conceptualizations of ADHD.

A Brief History of ADHD

Early conceptualizations of ADHD. Perhaps the first description of childhood hyperactivity is found in a picture book for children written and illustrated by physician Heinrich Hoffman in 1844 (Lin-Dyken & Wolraich, 1992). This book, entitled *Slovenly Peter, or Pretty Stories and Funny Pictures for Little Children*, includes a character named Fidgety Philip who displays many of the traits of the disorder now referred to as ADHD. However, it was not until the turn of the century that Still (1902) provided what would appear to be the first clinical descriptions of this disorder (Anastopoulos & Barkley, 1992; Barkley, 1990; Goldstein & Goldstein, 1990; Lin-Dyken & Wolraich, 1992; Weiss, 1991). In a series of reports to the Royal College of Physicians, Still describes a group of children in his clinical practice

whom he believed suffered from a "defect in moral control" (p. 1009). The symptoms ascribed to these children were very similar to those now considered to reflect ADHD.

Brain damage as a cause of ADHD. Unfortunately, however, Still's (1902) reports received little attention, and interest in the symptomology he described was minimal until the occurrence of an outbreak of encephalitis following World War I. Apparently, the behaviors of children who survived this brain infection were very similar to those of children who are today classified as ADHD. These children were reported to be "impaired in attention, regulation of activity, and impulse control" (Barkley, 1990, p. 6). Given the genesis of the renewed interest in these symptoms (i.e., the behavioral abnormalities of children who had suffered significant central nervous system insult), it is understandable that all behaviors of this type came to be viewed as being caused by some type of brain damage or trauma. This view of ADHD symptoms was popularized by Strauss and Lehtinen (1947) who emphasized organic etiologies (Lin-Dyken & Wolraich, 1992). They applied the label of Minimal Brain Damage to children who exhibited a variety of ADHD symptoms, even when no evidence of trauma or damage could be documented. Strauss and his co-workers asserted that the behaviors themselves were proof of brain damage (Barkley, 1990; Weiss, 1991). Also, it is noteworthy that during this same period Bradley (1937) first observed that childhood hyperactivity could be effectively treated with stimulant medication (Lin-Dyken & Wolraich, 1992).

Brain dysfunction as a cause of ADHD. As more and more clinicians began to question the argument that behaviors were a sufficient basis upon which to assume brain damage, Clements and Peters (1962, Clements, 1966) proposed a compromise. Minimal Brain Dysfunction, as Clements and his co-workers saw it, could explain these behaviors without requiring the physical proof of damage. The label of Minimal Brain Dysfunction, although considered to be an improvement over the previous terminology, was still judged to be problematic. First, research failed to support the theory that neurological dysfunction was the cause of ADHD symptoms (American Psychiatric Association, 1968; Stewart, Pitts, Craig, & Dieruf, 1966). Additionally, it was pointed out that this label applied to a very heterogeneous group of children who researchers at the time thought would need to be subclassified in the future (Weiss, 1991). These two factors combined to generate more specific labels for the symptoms of Minimal Brain Dysfunction. Among these more specific labels was "hyperactivity" which by the late 1960's was the most frequently used descriptive label for children displaying ADHD symptoms.

Hyperkinetic Syndrome of Childhood. Formal efforts to create more specific, valid, reliable, and scientific groupings began with the Ninth revision of the International Classification of Diseases (World Health Organization, 1978) and the first revision of *DSM* (American Psychiatric Association, 1968). Reflecting the prevailing view of the disorder at the time, the terminology used in these documents was Hyperkinetic Syndrome of Childhood. Use of this terminology was based in large part upon the work of Laufer and Denhoff (1957), and Chess (1960).

Attention Deficit Disorder with and without Hyperactivity. More recently, the research of Virginia Douglas (1972, 1983) was influential in supporting the hypothesis that the basic deficit of this disorder lies in difficulty regulating attention, arousal, and inhibitory control. Referring to ADHD children, she concluded: "These youngsters are apparently unable to keep their own impulses under control in order to cope with situations in which care, concentrated attention, or organized planning are required" (p. 275).

So influential was Douglas' work that it played a significant role in the development of *DSM III's* revision and renaming of the disorder (Barkley, 1990; Frick & Lahey, 1991; Healey, et al., 1993). With *DSM III* this condition became Attention Deficit Disorder with Hyperactivity or Attention Deficit Disorder without Hyperactivity (ADD or ADD-H). Considered to be the first detailed diagnostic definition of this condition (Frick & Lahey, 1991), it used a multidimensional conceptualization that required children to have deficits in each of the following three areas: inattention, impulsivity, and hyperactivity.

Although widely adopted, there were serious concerns about this schema during its short lifetime. Whalen (1989), for example, reports that there was concern over a lack of evidence that these criteria were more valid and reliable than that offered by *DSM II*. She cites sources that suggested *DSM III*

generated too many narrow diagnostic categories without sufficient empirical validation. In particular it would appear that there was concern regarding the validity of the multidimensional concept of ADD (i.e., that it could occur with or without hyperactivity). At about this time research was just beginning to suggest that there were some significant differences between these two groups of ADHD children (Whalen, 1989). Unfortunately, however, before *DSM III* criteria could be adequately studied, it was replaced by the *DSM III-R* definitions of Attention-deficit Hyperactivity Disorder and Undifferentiated Attention Deficit Disorder.

Attention-deficit Hyperactivity Disorder. Concerns regarding *DSM III* generated another revision of ADHD diagnostic criteria (*DSM III-R*, American Psychiatric Association, 1987). Using these criteria, the ADHD child was most frequently labeled as having an Attention-deficit Hyperactivity Disorder (ADHD). Unlike the *DSM III* criteria for this disorder, *DSM III-R* returned to a unidimensional definition. Using it a child was considered to manifest the disorder if he or she displayed 8 or more of 14 symptoms that reflect problems with inattention, impulsivity, and overactivity.

The strengths of *DSM III-R* included avoidance clustering particular items within a given construct simply on the basis of a committee decision (as was done for *DSM III*). Additionally, the items used in this revision were based upon factor analytic studies. Also, the cutoff score (i.e., 8 of 14 symptoms) used in making the diagnosis was based upon a field trial, and thus had an empirical basis. Finally, *DSM III-R's* specification of guidelines for severity of the disorder were also judged to be an improvement. Use of severity guidelines are reported to reflect the research findings that the disorder has a significant range of expression and situational variation (Barkley, 1990).

Criticisms of this conceptualization of ADHD focused on its unidimensional nature (Anastopoulos & Barkley, 1992; Barkley, 1990; Frick & Lahey, 1991; Healey, et al., 1993; Lahey, et al., 1988; Munoz-Millan & Casteel, 1989). For example, Frick and Lahey (1991) cited the growing body of evidence "that attention deficits and motor hyperactivity represent distinct behavioral dimensions" (p. 165). They reported factor analyses of teacher rating scales found items that described attention difficulties and overactivity loaded on separate factors. Similarly, Frick and Lahey (1991) cited findings that indicated teacher ratings using *DSM III* criteria yielded a two-factor solution. More recently Healey, et al. (1993), obtained data that lent support to the distinction between inattention and hyperactivity symptoms. While these studies failed to support the three dimensions of ADD specified by *DSM III* (impulsivity did not form a third factor and instead tended to load with the hyperactivity factor) they were also interpreted as suggesting the unidimensional nature of ADHD to have been potentially misleading.

Undifferentiated Attention Deficit Disorder. *DSM III-R* (American Psychiatric Association, 1987) also created a tentative category, Undifferentiated Attention-deficit Disorder (UADD), that allowed clinicians to distinguish between the attentional and motoric dimensions of this disorder. However, its tentative nature made it difficult to use (Frick & Lahey, 1991; Munoz-Millan & Casteel, 1989). UADD was defined by *DSM III-R* as follows:

This is a residual category for disturbances in which the predominant feature is the persistence of developmentally inappropriate and marked inattention that is not a symptom of another disorder, such as Mental Retardation or Attention-deficit Hyperactivity Disorder, or of a disorganized and chaotic environment (American Psychiatric Association, 1987, p. 75).

As can be seen minimal criteria were provided for the diagnosis of UADD. Apparently, the American Psychiatric Association committee that drafted these criteria felt that there was insufficient research evidence to guide their deliberations, and as a result, little information was provided about the disorder (Barkley, 1990).

The Current Conceptualization of ADHD

Attention-Deficit/Hyperactivity Disorder. The most recent revision of *DSM* criteria for ADHD contains within it significant changes (Barkley, 1993). It appears to take into account research that has suggested UADD to be a real clinical entity (Anastopoulos & Barkley, 1992; Barkley, 1990; Frick & Lahey, 1991). The *DSM IV* (American Psychiatric Association, 1993) criteria for this disorder are found in Table 1.1. As can be seen this latest version of *DSM* (American Psychiatric Association, 1994) returns

to the subtyping labels originally suggested by *DSM III* (i.e., with or without Hyperactivity). Using these new criteria a child could be diagnosed as being Attention-deficit/Hyperactivity Disorder, Predominantly Inattentive Type Attention-deficit/Hyperactivity Disorder, Predominantly Hyperactive-Impulsive Type; or Attention-deficit/Hyperactivity Disorder, Combined Type. Diagnostic criteria for the Predominantly Inattentive Type require that 6 or more of the 9 symptoms of inattention be present. Of these 9 symptoms, 5 are essentially *DSM III-R* items. Four items in the criteria for this type are new to *DSM IV* [i.e., "often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities, "often has difficulty organizing tasks and activities," "often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort, " and "is often forgetful in daily activities" (pp. 83-84)]. Diagnostic criteria for the Predominantly Hyperactive-Impulsive Type require that 4 or more of the 6 symptoms of hyperactivity and impulsivity be present. Of these 6 symptoms 5 are essentially *DSM III-R* criteria. One item in the criteria for this type is new to *DSM IV* [i.e., "Often runs about or climbs excessively in situations in which it is inappropriate" (p. 84)]. In this revision, ADHD diagnostic criteria were placed within a subclass known as "Disorders Usually First Diagnosed in Infancy, Childhood, or Adolescence" (pp. 37-121). Along with ADHD, this subclass includes Conduct Disorder, and Oppositional Defiant Disorder.

Although the specific behavioral characteristics or symptoms presented by *DSM IV* (American Psychiatric Association, 1994) are self explanatory, several aspects of these diagnostic criteria deserve further elaboration. First, it is important to ensure that the criterion behaviors represented a disturbance lasting at least 6 months. This is especially critical when working with the preschool-aged child. In this population up to 40% of children are rated as inattentive and overactive by their parents. However, in the vast majority of these cases these concerns remit within 3 to 6 months. In other words, significant inattention and hyperactivity in the 3 to 4 year old is not necessarily indicative of a persistent pattern of ADHD (Barkley, 1990). Strict adherence to this diagnostic requirement is made even more important by Barkley's (1990) observation that current research indicates this requirement should be increased to 12 months.

TABLE 1.1

*DSM IV Criteria for Attention-deficit/Hyperactivity Disorder (ADHD)*³

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 to 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 behavior or failure to understand instructions)
- (e) often has difficulty organizing tasks and activities

Table 1.3 (continued)

³ From the *Diagnostic and Statistical Manual of Mental Disorders*, (4th. ed., pp. 83-85) by the American Psychiatric Association, 1994, Washington, DC: Author.

- (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 an other mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder).

Second, it is important to note that the criteria begin by specifying that a criterion is considered to be met only if the behavior is ". . . inconsistent with developmental level" (p. 83). According to *DSM IV* (American Psychiatric Association, 1987):

Symptoms of inattention are common among children with low IQ who are placed in academic settings that are inappropriate to their intellectual ability. These behaviors must be distinguished from similar signs in children with Attention-Deficit/Hyperactivity Disorder. In children with Mental Retardation, an additional diagnosis of Attention-Deficit/Hyperactivity Disorder should be made only if the symptoms of inattention of hyperactivity are excessive for the child's mental age (pp. 82-83).

This means, for example, that if a developmentally delayed 12-year-old with a mental age of 6-years, displays a criterion behavior in a manner typical of a 6-year-old, it would not meet *DSM IV* criteria for

ADHD. However, if the same child displays one of the criterion behaviors in a manner that is typical of a 3-year-old, it would meet *DSM IV* criteria.

Third, it is specified by *DSM IV* that symptom onset be before the age of seven. This manual reports: "Most parents first observe excessive motor activity when the children are toddlers, frequently coinciding with the development of independent locomotion" (American Psychiatric Association, 1994, p. 82). It is possible that a neurologically comprising event, such as a head trauma or hypoxic injury, may cause ADHD after age 7 (Barkley, 1990). Typically, however, if symptom onset is after the age of 7, they are in all likelihood being caused by something other than ADHD (e.g., substance abuse, physical illness, etc.). Preston (1987), for example, suggests that late onset attentional difficulties are typically due to emotional problems. It is important to note, however, that this diagnostic criterion does not mean that the diagnosis must be made before the age of 7. It can be made in adulthood if the diagnostician is able to verify that the symptoms were present before this cut-off age.

Fourth, the impairment from the symptoms must be present in two or more settings. According to *DSM IV*: "Behavioral manifestations usually appear in multiple contexts, including home, school, work, and social situations" (p. 79). Thus, for the diagnosis to be made information must be gathered from two or more different sources and/or settings (e.g., parents and teachers and/or home and school). If the symptoms are only present in one context (e.g., they are only seen at school and not observed at home, in the community, or in social situations) then alternative explanations for the symptoms must be carefully considered. For example, the presence of a specific learning disability may result in symptoms of ADHD at school, but not in other settings.

Finally, the differential diagnosis of this disorder requires that "Age-appropriate behaviors in active children," "Mental Retardation," "under-stimulating environments," "oppositional behavior," and other mental disorders including "Pervasive Developmental Disorders," "Psychotic Disorder," and "Other Substance-Related Disorder Not Otherwise Specified" (pp. 82-83) be considered and ruled out as primary causes of the observed symptoms before making the diagnosis of ADHD.

Strengths of DSM IV criteria. The criteria provided for the Predominantly Inattentive Type is clearly an improvement over the guidelines provided by *DSM III-R* for UADD. These guidelines account for the criticisms of the previous unidimensional definition of ADHD. They would appear to be consistent with the research of Lahey, et al. (1988) and Healey, et al. (1993) which yielded two-factor solutions for *DSM III* and *DSM III-R* criteria with all hyperactivity items loading on one factor and all attention items loading on a second factor. Also consistent with this research is the fact that impulsivity items associated with acting before thinking and difficulty waiting turns are combined with the hyperactive dimension. The research of Lahey et al. and Healey, et al. on the *DSM* criteria did not find justification for a third impulsivity dimension. Rather, first Lahey et al. and then Healey, et al. reported that these items load on the hyperactivity dimension, creating a hyperactivity/impulsivity factor.

DSM IV would also appear to be responsive to the criticisms offered by Frick and Lahey (1991). These authors cited research suggesting children falling within these two dimensions differ from one another in several clinically important ways. The *DSM IV* criteria would appear to allow clinicians to make diagnoses that allow for these clinically important differences to be more readily recognized. It is for this reason that the current research will employ *DSM IV* criteria.

Criticisms of DSM IV criteria. Criticisms of this revision of *DSM* have been offered by Barkley (1993). First, he suggests that the separation of hyperactivity items from impulsivity items within the Hyperactivity-Impulsivity subtype "makes no sense scientifically or conceptually" (p. 8). He bases this criticism on the fact that field trial data and other research (e.g., Lahey, et al., 1988; Healey, et al., 1993) have shown that these items correlate to such an extent that they must be concluded to form a single behavioral dimension. What is more important, however, Barkley strongly disagrees with the idea of ADHD subtypes. He states:

By listing the children who are inattentive but not hyperactive-impulsive . . . as a 'type' of ADHD, we are back to the old conceptualization of this disorder as somehow akin to ADHD or the hyperactive-impulsive type. Yet a decade of research and three separate reviews of that literature

have concluded that these two disorders have sufficient differences to indicate they are different disorders (p. 8).

Barkley (1993) concludes that current research suggests that Attention-Deficit/Hyperactivity Disorder, Predominantly Inattentive Type (or UADD) and Attention-Deficit/Hyperactivity Disorder, Predominantly Hyperactive-Impulsive Type (or ADHD) ". . . are distinct conditions, not subtypes of a common disturbance in attention" (p. 8). Barkley (1990, 1993) also suggests that while the inattentive type of ADHD may be a disorder of focused attention, the hyperactive-impulsive type of ADHD is probably not a disorder of attention at all. Instead he suggests that it is a disorder of behavioral inhibition and impulse control.

Perhaps more basic concern focuses on the considerable debate regarding the validity of ADHD as a discrete clinical entity. Whalen (1989) points out that some researchers consider ADHD and learning disabilities to be different manifestations of the same problem. Similarly, others have suggested that ADHD and Conduct Disorders are different labels for the same global externalizing disorder. Still other authors have suggested ADHD to be a uniquely American problem (Whalen, 1989) that may be more a function of deficits within the educational system than within the child (Meents, 1989). Finally, the lack of a clear cut pattern for identifying ADHD and uncertainty about what causes this condition have lead other researchers to conclude that this conceptualization of ADHD lacks validity and reliability (Goodman & Poillion, 1992).

Concerning learning disabilities, Whalen (1989) concludes that factor analytic studies indicate that it is valid to view the two as relatively independent dimensions. Fergusson and Horwood (1992), for example, found that while attention deficits influenced reading achievement, there was no evidence that reading achievement influenced attention deficit levels. Thus, it would appear that there is support for the view that ADHD and learning disabilities are separate disorders.

In attempting to address the issue of the validity of the ADHD classification as separate from Conduct Disorders or Oppositional Defiant Disorders, Whalen employs Shaffer's (1980) summary of the Kraepelinian criteria of a syndrome to addresses the postdictive, concurrent, and predictive validity of ADHD. Postdictive validity refers to the need to document that the syndrome has different etiological influences. In this regard she reports that, although "sparse," there is evidence to suggest that while ADHD may have a neurodevelopmental origin, Conduct Disorder would appear to have psychological origins. Concurrent validity refers to the need to document that the syndrome has a unique pattern of behavior. In this regard she reports that research has suggested ADHD to be significantly different from Conduct Disorder in a number of important ways (e.g., cognitive functioning, social functioning, and classroom functioning). Finally, predictive validity refers to the need to document that the syndrome has differences in prognosis and treatment responsiveness. In this regard she cites studies that suggest there is a better prognosis for those with hyperactivity than for children with Conduct Disorder or ADHD and Conduct Disorder combined. Additionally it would appear that pure hyperactive children are better responders to stimulant therapy. Summarizing this evidence Whalen concludes: ". . . despite their obvious overlap, it is highly useful to distinguish the two broad dimensions of hyperactivity and oppositional or conduct problems and . . . to study both the unitary and the hybrid manifestations of these problem domains" (p. 135).

Questions have also been raised about the frequency of ADHD in different cultures and whether the disorder is a uniquely American cultural or educational phenomenon. In response to such questioning, Whalen (1989) reports that while cross-national frequency rate differences do exist, the range is similar to that found in similar studies conducted within the United States. Additionally, the rate of ADHD in this country does not fall in the upper end of the cross-national distributions. She concludes: "The available cross-national evidence indicates that ADHD is a widespread if not universal pattern, and there is no basis for attributing these problems to distinctive cultural practices" (p. 137). This finding can be considered a flaw in Meents' (1989) argument that a specific educational system is to blame for ADHD symptomology. While it is still likely that the nature of any educational system and its demands for on-task behavior contributes to the problems these children experience, it would not appear that the

American system of public education is unusually problematic for ADHD children. If it were, we would expect to find an unusually high rate of ADHD in this country.

The final criticism of this condition to be addressed has been put forth by Goodman and Poillion (1992). These authors have presented an interpretation of research findings indicating there to be 69 characteristics of ADHD and 38 causes of the disorder. From this interpretation they suggest it must be concluded that there is no clear-cut pattern for identifying the condition and little agreement for what causes ADHD. However, a careful examination of the data they used to generate these numbers and conclusions reveals that there is substantial agreement on the characteristics and causes of ADHD. Concerning the characteristics of this condition, a short attention span, hyperactivity, and impulsivity were the three most frequently cited symptoms of ADHD. They were cited in 82.05%, 74.36%, and 71.79% respectively of the studies. Additionally, 53 of the 69 characteristics were cited in 10.26% or fewer of the studies. Furthermore, all 68 could be grouped into one of seven categories, with a majority falling within three they labeled as "Attentional," "Hyperactive," and "Impulsive" (p. 42). Concerning the 38 causes of the disorder, careful examination of these studies again reveals that 48% of the studies cited suggest that genetics is a cause of this disorder. Furthermore, 26 of these hypothesized causes are cited in fewer than 2 of the studies reviewed. Thus, despite Goodman and Poillion's claims to the contrary, it would appear that there is in fact significant agreement on what ADHD is and what are its causes. The variance in symptoms and etiologies that is actually present between these studies might perhaps best be accounted for by the fact that the *DSM III-R* criteria used in most current research are unidimensional and the disorder is comorbid with a number of other conditions. In other words, it would seem likely that if researchers were more careful about the types of ADHD they were studying, there would be even greater agreement on characteristics and causes.

A Conceptualization of Reading Comprehension

The ability to read is an essential activity in our society. It is one of the basic ways of acquiring new information and knowledge. The failure to read well places a student at a serious disadvantage with respect to academic and thus vocational opportunities (Adams, 1980). Because so much depends upon the ability to understand textual information, it is important that difficulties with this skill be identified early and the appropriate remedial actions taken. This is an important purpose of the current research. It attempts to discover if children who have ADHD have difficulty with reading comprehension. Before discussing the current research, however, it is important to understand what reading comprehension is and what skills or processes it requires.

Generally speaking reading comprehension can be defined as the process by which a reader constructs meaning by interacting with a text (Anderson & Pearson, 1984). Irwin (1986) defines this process as follows:

Comprehension can be seen as the process of using one's own prior experiences (reader context) and the writer's cues (text context) to infer the author's intended meaning. This process can involve understanding and selectively recalling ideas in individual sentences (microprocesses), inferring relationships between clauses and/or sentences (integrative processes), organizing ideas around summarizing ideas (macroprocesses), and making inferences not necessarily intended by the author (elaborative processes). These processes work together (interactive hypothesis) and can be controlled and adjusted by the reader as required by the reader's goals (metacognitive processes) and the total situation in which comprehension is taking place (situational context) (p. 9).

While there is not agreement on a list or set of discrete reading comprehension skills (Cooper, 1986; Irwin, 1986), there is agreement that the process of reading comprehension depends upon a variety of perceptual, linguistic, and cognitive processes. Difficulties with one or more of these processes may affect reading comprehension (Adams, 1980). The following classification of reading comprehension processes has been adapted from May (1986).

Graphophonic Ability. The first step in reading is to register printed text and to decode words. In the skilled reader this is done automatically, and can be assessed by both reading speed tests and by word identification measures. In general, individuals with better reading comprehension ability can read

quicker and have larger sight vocabularies. These individuals have a good visual memory for words.

However, even the skilled reader will come across words not immediately recognized. One strategy for reading these words is to use phonetic or decoding skill to "sound-out" the word. For the skilled reader, recognition of sound-symbol relationships is automatic, and can be assessed by word attack tests.

It is important to note, however, that reading comprehension may suffer if the reader devotes too much attention to decoding activities. Recognition of every written word in a text is not necessary for comprehension of the author's intended message. Nevertheless, decoding ability is an important prerequisite to reading comprehension.

Syntactic Awareness. Awareness of syntactic rules provides contextual hints that help readers to anticipate and thus read the words within sentences. The order of words in a sentence or the type of word (noun, verb, adverb, adjective) provides hints about what the reader might expect next. For example, skilled readers anticipate a noun or an adjective following the word *the* (May, 1986). Syntactic awareness is also the primary means by which readers can identify the intended relation among words. For example, this awareness helps the reader to differentiate between the meaning of sentences such as "John was kicked by Mary" and "John kicked Mary." Not only does it help to clarify what the words refer to, but it also defines new relations among them (Adams, 1980).

Reading comprehension difficulties due to weak syntactic awareness can be especially common in children. As children mature, however, syntactic awareness typically improves. Substantial gains in their understanding of syntactic structure are made until children are at least 13-years-old (Palermo & Molfese, 1972).

Semantic Ability. Beyond recognizing the written word, reading comprehension also requires the reader to attach meaning to the words being read. Understanding of what the author is trying to communicate through a text provides semantic cues that can facilitate reading comprehension (May, 1986).

Inefficient vocabulary is a key deficiency that may adversely influence the reader's ability to understand and take advantage of semantic cues. This is an especially common problem among young children. Vocabulary is the single best predictor of a child's reading comprehension ability (Adams, 1980). Thus, vocabulary tests, which provide an estimate of the number of words a child understands, can be an important tool in the assessment of reading comprehension.

The reader's ability to organize a text is also an important semantic skill (Adams, 1980). This skill involves the identification of a text's topic, and the main ideas that develop from it. In constructing a text's meaning, less important ideas are added in proper relation to the text's topic and irrelevant or unimportant information ignored. This skill relies heavily upon on a type of attention known as "focused attention." Smiley, Oakley, Worthen, Campione, and Brown (1978) have shown that sensitivity to gradations in the importance of a text's idea units is poor among beginning readers.

Schematic Cues. Prior background knowledge is important to reading comprehension. Experience with things, people, and oral language will make it easier for the reader to relate to an author's intended message, and thereby improve reading comprehension (May, 1986). Bransford and Johnson (1972), for example, have shown that if a reader is unfamiliar with the topic of a text, it may be difficult to understand even if the words that comprise the passage are easy to read. On the other hand, experts on a topic will comprehend and remember new information about it more easily. The reader who has a pre-existing schema for a text's topic is more likely to possess the vocabulary needed to understand it. Also, this reader is likely to already have an idea about what is important in a text, and what is likely to be presented (Carpenter & Just, 1986).

Other factors that may influence reading comprehension. Cooper (1986) identifies several other factors that may influence reading comprehension. These include the reader's attitudes, purpose for reading, and general physical and emotional condition.

Attitudes toward reading can have an important influence on what the reader comprehends. Simply put, the reader with a negative attitude toward reading will not be as effective at comprehending

text as will the reader with a positive attitude. Even when a reader has all the necessary skills to comprehend a text, his or her attitude toward reading will influence the application of these skills.

The reader's purpose for reading a text will also influence his or her reading comprehension. It will influence what it is in the text that the reader pays attention to. For example, if a text is being read in preparation for a multiple choice test, the reader will likely pay attention to every detail. On the other hand, if a text is being read to gain a general understanding of the topic being discussed, the reader will likely focus on the main ideas. While the former will emphasize sustained attention to the task, the later will rely more heavily on focused attention to the text.

Finally, as happens for all learning activities, the reader's general physical and emotional state will influence reading comprehension. The reader who is physically ill or emotional upset may not have the resources available to effectively comprehend a text.

Reading Comprehension Failures. According to Adams (1980), "true reading is only possible if the whole complex of subprocesses are functioning easily and in proper coordination. None of the processes can be absent or require undue attention, or comprehension will suffer" (p. 14). For skilled readers, reading comprehension processes happen simultaneously and without much conscious effort. Poor readers, on the other hand, who have difficulty with one or more of these subskills, will not perform them as easily. As a result, they will need to devote more of their attentional resources to text recognition. Given that the human mind has a limited processing capacity, special attention to any of the particular reading comprehension processes (e.g., word identification, decoding, etc.) will adversely affect reading comprehension. The child with a limited sight vocabulary will need to pay more attention to decoding the words, and will not be as able to pay attention to the author's intended message. In other words, poor readers need to devote more of their attentional resources (or processing capacity) to text recognition and thus have fewer resources available for text understanding (Adams, 1980).

This problem is particularly critical for younger readers (Adams, 1980). Not only do children have smaller functional memory capacities than do adults (Farnham-Diggory, 1972), but they also have not automatized reading comprehension processes to the degree found in the skilled adult reader.

The Current Research

The current research was designed to investigate one aspect of the academic achievement of children with ADHD. This study compares the reading comprehension abilities of a group of intermediate grade (grades 4, 5, and 6) children who were previously diagnosed as having ADHD, to a group of carefully matched age/grade peers who do not have this disorder. The rationale for this study will be reviewed in the following chapter.

To address the research that has suggested attentional and hyperactive/impulsive symptoms to load on separate factors (Lahey, et al., 1988; Healey, et al., 1993), and the concern that these factors may represent separate disorders (Barkley, 1993), attempts were made to exclude from the study's sample children who had primarily hyperactive/impulsive symptoms. In the language of *DSM IV* (American Psychiatric Association, 1994) the participants in this study might be classified as either Predominately Inattentive or Combined Types.

The intermediate grade age group was chosen because it is at this point in a student's academic career that reading comprehension becomes an essential activity for learning. Until this grade level the instructional emphasis has been on learning to read. In the intermediate grades, however, students begin to read for new learning (Chall, 1979).

A unique aspect of this study was that it investigated group differences in different levels of comprehension. These levels have previously been discussed by Kintsch and van Dijk (1978), who make the distinction between microprocessing and macroprocessing. They state that microprocessing has to do with comprehension of text at a local level. For example, understanding the meaning of a single sentence within an extended passage would be considered a microprocessing skill. On the other hand, macroprocesses are skills that allow for a global understanding of an entire text. It is through these processes that readers construct ideas about the meaning or gist of an extended passage.

This study also investigated group differences in the metacognitive skill known as comprehension monitoring. This skill involves the ability to recognize the degree to which a just read passage has been comprehended. According to Gambrell and Bales (1986): "Comprehension monitoring is defined as an executive function that directs cognitive processing as the reader strives to make sense of incoming textual information" (pp. 455-456). They further suggest: "Reading, by definition, must involve active monitoring of one's own comprehension. Without knowledge about one's own level of comprehension, important information that could help the reader reach a more complete understanding of the text is lost" (p. 456).

To focus specifically on the effect of ADHD on reading comprehension it was important to control for other variables known to affect this skill. Thus, participants were matched according to their age, grade, gender, and level of primary caregiver's education. Each of these variables is likely to influence the reader's ability to take advantage of a text's schematic cues. The importance of taking into account such background knowledge has been emphasized by Spring (1985) who found that good readers report relating text material to prior knowledge significantly more than poor readers. He concludes that identification of important ideas within a text involves assessing a proposition's ". . . meaning relationship with other propositions in the text and with the reader's background knowledge" (p. 165). Taylor (1979) comes to a similar conclusion when she states: ". . . the results of this study support the theoretical notion that efficient reading is a schema-based process" (p. 379). She also cites several studies that indicate reading to be an ". . . interactive process which involves both knowledge-based and text-based analysis" (p. 375) (Adams & Collins, 1979; Federikson, 1979; Rumelhart, 1977).

Additionally, to help control for the effect of graphophonic skill on comprehension, participants were matched on a measure of word identification ability. To insure adequate decoding abilities, all participants included in the study's sample had word identification test scores in the average range or higher. Finally, a procedure was used to screen-out children who had potential reading disabilities. This involved obtaining an estimate of verbal intelligence and comparing it to word identification ability.

Once identified, all participants were administered a battery of tests. The first tests administered were designed to assess group differences on other variables known to affect reading comprehension. These tests assessed word attack skill, background science knowledge, reading speed, and automaticity. Once these supplementary screening tests were administered, tests designed to assess microprocessing and macroprocessing reading comprehension skills, and comprehension monitoring were given.

Microprocessing was assessed with cloze tasks. Using this procedure, every tenth word from a naturally occurring intermediate grade science text passage was deleted and replaced by a line equal in length to the deleted word. Participants were asked to fill in the missing words as they read the passage. Macroprocessing was assessed by having students read extended passages from a naturally occurring intermediate grade science text and then identifying the topic and main ideas. The next procedure used assessed the comprehension monitoring skills of the participants. Immediately after reading the science texts designed to assess macroprocessing, participants were asked to rate on a 5 point Likert-type scale how well they understood the text just read. The correlation between this self rating and the participants' actual macroprocessing performance served as the measure of comprehension monitoring. The final procedure asked the parents and teachers of the study's participants to complete a set of rating scales designed to assess ADHD symptom severity.

Hypotheses

To summarize the current research, the study's hypotheses are as follows:

1. Reading comprehension abilities of children diagnosed as ADHD are significantly weaker than those of carefully matched children who do not have this disorder.
2. There is an interaction between the type of reading comprehension task and group membership. Specifically, it is hypothesized that when compared to macroprocessing (Topic and Main Idea Identification Tests), group differences on microprocessing tasks (Cloze Test) are relatively small.
3. The comprehension monitoring abilities of children diagnosed as ADHD are not as highly developed as are those of carefully matched children who do not have this disorder.

4. The severity of ADHD symptoms negatively correlates with macroprocessing (Topic and Main Idea Identification Tests) and microprocessing (Cloze Tests) reading comprehension performance. Children with more severe ADHD symptoms will have lower reading comprehension test scores.

CHAPTER II

Review of the Literature

Origins of the Research Question

Research on academic achievement of ADHD children has found poor school achievement in both elementary and secondary school years to be an almost universal problem (Barkley, 1990; Barkley, Fisher, Edelbrock, & Smallish, 1990; Dykman & Ackerman, 1991; Fergusson and Horwood, 1992; Lambert & Sandoval, 1980; Minde et al., 1971; Weiss & Hechtman, 1986). Fergusson and Horwood, for example, cite several studies that report academic delays to be common among children with ADHD (Carlson, Lahey & Neeper, 1986; Holborrow & Berry, 1986; Schachar, Rutter, & Smith, 1981). Additionally, Barkley (1990) reports: "Almost all clinic-referred ADHD children are doing poorly at school . . ." (p. 75). He also cites several studies that indicate ADHD children score 10 to 15 standard score points lower on standardized achievement tests than do peers who do not have this disorder (Barkley, DuPaul, & McMurray, 1990; Cantwell & Satterfield, 1978; Fisher, Barkley, Edelbrock, & Smallish, 1990; Safer & Allen, 1976). Not surprisingly, given these findings, ADHD has been found to have a significant negative effect on long-term educational outcome (Wood & Felton, 1994).

Results such as these point to the need for additional research examining the expression of these academic deficits among ADHD children. The current study hopes to provide a more complete description of one aspect of the ADHD child's academic achievement by investigating how this disorder influences reading comprehension abilities.

The need for this research is further illustrated by an extensive library computer search. This search made use of the American Psychological Association's *PsychLIT* Database, the U.S. Department of Education's *ERIC* database, and the University of California's *Melvyl* on line catalogue. Using the search terms "attention deficit" and "reading comprehension" the topic of the ADHD child's reading comprehension abilities was found to be a relatively neglected area of study. In fact, no published research specifically examining the reading comprehension skills of these children was found. The only citation for research of this type found in the just mentioned databases was a paper presented at the meeting of the National Council on Learning Disabilities (found in the *ERIC* database). In this paper Cherkes-Julkowski and Stolzenberg (1991, October) built upon previous research (Stolzenberg & Cherkes-Julkowski, 1991, September) that found extended processing tasks accounted for most of the variance among academic tasks in ADHD children.¹ In this later study they compared a measure of reading comprehension that used short passages (the *Woodcock-Johnson Tests of Achievement* Passage Comprehension subtest), to one that used longer ones (the *Gray Oral Reading Test*). Participants (all in grades 1 through 12) included two groups of children with ADHD (medicated and unmedicated), children with learning disabilities, and nonhandicapped children. Results were interpreted as suggesting that ADHD children perform poorer when required to read longer as opposed to shorter passages, and that ADHD children perform poorer than other children when required to read longer passages. From these results it was concluded that measures traditionally used to assess reading disabilities are insufficient in identifying reading difficulties among children with ADHD. The use of encapsulated tasks (such as is found in the *Woodcock-Johnson Tests of Achievement* Passage Comprehension Subtest) fails to identify the reading difficulties of children with ADHD. The use of longer reading passages was judged to be important when children with ADHD are referred for academic evaluations.

Cherkes-Julkowski and Stolzenberg's (1991, October) conclusions regarding the need to use extended passages to assess the ADHD child's reading disabilities agree with the methodology of the current research. However, Cherkes-Julkowski and Stolzenberg's conclusion that ADHD children

¹ In this research Stolzenberg and Cherkes-Julkowski (1991, October) were making a case for their position that ADHD is an attention-based learning disability, and that it is qualitatively different from language-based learning disabilities. In making this argument they reported that while ADHD children perform poorer on extended processing tasks as opposed to shorter tasks, task length did not affect the performance of the language-based learning disabled child.

perform poorer than other children when required to read extended passages has at least two significant limitations. First, there was no attempt to control for, or measure, participant performance on other skills known to affect reading comprehension. For example, it is possible that ADHD children performed poorer than other children on reading comprehension tasks because they had weaker word identification, and/or word attack skills. Also, there is no documentation of the absence of learning disabilities among the ADHD group. As ADHD frequently co-exists with learning disabilities, it is possible that some of these children had difficulties comprehending extended passages not because of attentional difficulties, but because of specific reading disabilities. The current research will address these limitations by either matching or assessing participant performance on measures of skills known to be important to reading comprehension, and by including a screening for reading disabilities in the study's protocol.

Three additional studies, while not specifically focused on reading comprehension, have examined the relationship between these abilities and ADHD symptoms. For example, in their study of ADHD symptoms and reading achievement, Fergusson and Horwood (1992) developed a structural equation model to assess the potentially reciprocal relationship between ADHD and reading achievement.

This research was part of a longitudinal study of the health, development and welfare of a birth cohort of 1,265 New Zealand children. At both 10 and 12 years, 777 of these children (this subsample represented those children who lived in the region being studied at both ages) were studied on measures of reading (word recognition and reading comprehension achievement tests) and attention (parent and teacher rating scales). At 12 years the measures of attention deficit were supplemented with child self-reports. The correlations between these measures were used to create a fitted model of reading achievement and attention deficit. This model was interpreted as suggesting that a child's level of attention deficit influences reading achievement. Conversely, however, there was no evidence to suggest that reading ability influences attention deficit. In other words, while higher ratings of ADHD symptoms predicted poor reading performance, poor reading performance did not predict greater ADHD symptoms. On the other hand, a second study by Rowe and Rowe (1992) using structural equation modeling came to a somewhat different conclusion. These researchers used this modeling to suggest that not only does a student's inattentiveness have a strong negative effect on reading achievement, but also that reduced achievement leads to increased inattentiveness in the classroom.

Concerning the current research, these data suggest that ADHD symptom severity should be expected to affect reading achievement. In other words, it will be expected that this study will find symptom severity to be negatively correlated with reading comprehension test scores. However, because these previous studies could not control for word identification skill, nor use a control group, it is not possible to make specific conclusions regarding how the reading comprehension abilities of ADHD readers differ from children without this disorder. For example, it cannot be determined if ADHD symptoms affect reading comprehension when word identification skills are controlled. It is possible that in the Fergusson and Horwood (1992), and Rowe and Rowe (1992) studies ADHD symptoms primarily affected word identification abilities and that the effect on reading comprehension test scores was secondary to this primary affect.

Perhaps a more fundamental difficulty with the Fergusson and Horwood (1992), and Rowe and Rowe (1992) studies is that the procedure used to document ADHD symptomology are not sufficient to diagnosis this disorder. Currently, there is no single diagnostic procedure available to diagnosis ADHD (Brock, 1995; Lin-Dyken & Wolraich, 1991; Morriss, 1992, May). As a result, best practice relies upon a multimethod approach (i.e., health history, rating scales, psychometrics, observation of the child's behavior, and reports of adults in the child's environment) to make this diagnosis (Morriss, 1992; Sandoval, Lambert, & Yandell, 1976). While these two studies use of rating scales was adequate in demonstrating the presence of behaviors similar to ADHD, there is no assurance that these behaviors were associated with ADHD. As a number of different pathologies can result in ADHD-like symptoms, this research may have been investigating the effect of conditions other than ADHD on reading achievement. Unlike these previous studies, the proposed research would include in the ADHD sample only those children who had been diagnosed ADHD before study participation.

A third study to use a measure of reading comprehension in an investigation of ADHD children was conducted by Loge, Steton, & Beatty (1990). In this study the performances of 20 children who met DSM III-R criteria for ADHD were compared with those of 20 matched normal children on a battery of neuropsychological tests. This study of performance on tasks sensitive to frontal lobe dysfunction, found impaired functioning in microprocessing reading comprehension among ADHD children when compared to matched normals. This finding supports the current proposal's hypothesis that performance on reading comprehension tests will distinguish ADHD and matched comparison groups. However, an analysis of this study's methodology reveals confounding variables that might undermine this support. First, this study made no attempt to control for word identification skill. Thus, it is possible that the children in this study had reading comprehension difficulties that were due to poor decoding skill, and not due to the effects of ADHD. In fact, 4 of the ADHD children, but none of the controls, were reported to have been diagnosed by school psychologists as having a learning disability. Second, the investigators only assessed the ability to comprehend text at the sentence level. Thus, the reported differences in reading comprehension do not reveal how these children might have differed in their ability to construct ideas about the gist of an extended passage. The current research will strive to overcome these design concerns by matching participants according to their word identification skill and screening out subjects who show indications of a specific reading disability. Also, it would assess the ability to comprehend at both the sentence and the passage levels.

How ADHD May Effect Reading Comprehension

Recent research suggests that ADHD does not have an impact on the development of word reading ability (Wood & Felton, 1994). However, competent reading requires more than the ability to read words. From the fact that reading is a complex task, requiring a number of processes operating simultaneously, comes an explanation for how ADHD may affect reading comprehension. Not only does reading comprehension involve the recognition of individual words, but it also requires constructing the meaning of sentences (microprocessing). Furthermore, when determining the gist of an extended passage it also requires organization of the text (macroprocessing). Simply put, there is a lot to which the reader must devote attention. Thus, it could be argued that reading comprehension tasks, such as macroprocessing, may exceed the attentional capacity of the student with ADHD.

One model for how reading comprehension may exceed the attentional capacity of the student with ADHD is found when this skill is placed within the automatic and effortful processing framework offered by Hasher and Zacks (1979)². Simply put, this framework suggests that ". . . there is a continuum of attentional requirements among encoding processes; processes at either end of this continuum will be referred to as automatic and effortful³ processes" (p. 358). Some mental operations are innately automatic and others may become so by extensive practice. Still other mental operations are necessarily effortful in nature. Examples of tasks that are innately automatic include encoding frequencies, spatial locations, and time of events. "Encoding the meaning of words from their written presentations. . ." (p. 360) is an example of a task that may become automatic following extensive practice. These automatic processes are not limited by attentional capacity. On the other hand, effortful processing requires considerable sustained attention. Effortful mental operations are slow, serial, and initiated intentionally. Effortful processes, such as identifying the gist of an extended text, involve deliberate deployment of learning strategies. Thus, while reading and understanding individual words within a passage can become an automatic process, reading, understanding, and organizing an extended passage's underlying meaning is more likely to be an effortful one.

² Automatic and effortful processing were also a part of the earlier works of Brown (1975), Kahneman (1973), Posner and Snyder (1975), Schneider & Shiffrin (1977), and Shiffrin and Schneider (1977).

³ Effortful processing is referred to by some authors as control-processing (e.g., Fisk & Schneider, 1981; Schneider & Shiffrin, 1977; Shiffrin & Schneider, 1977).

That effortful tasks would be difficult for the ADHD child is made clear by Hasher and Zacks (1979) who state that ". . . variations in attentional capacity should have major effects on the efficiency with which effortful processes occur" (p. 363). As was mentioned in Chapter 1, research to date has suggested that children with ADHD have their greatest difficulty with tasks that require sustained attention (Douglas, 1983). Thus, while it might be argued that ADHD children will not necessarily have trouble decoding individual words, they will be more likely to have reading comprehension problems as a result of their poor sustained attention span.

Clearly, reading comprehension, especially of new or unfamiliar material, is an activity that will require sustained effort and concentration. In Piagetian terms such reading comprehension tasks require either the construction of new schemes or accommodation to existing schemes. A scheme is a pattern of thinking that people use in classifying ideas. Accommodation is the process of changing an existing scheme to fit a new idea. Reading an unfamiliar expository text (e.g., reading a science text to learn about an unfamiliar topic) will involve either the construction of new knowledge structures or the modification of existing knowledge structure. This type of task will be effortful and thus should be difficult for the ADHD child who has problems with sustained attention. On the other hand, it might be speculated that when an ADHD child is asked to read familiar material, he or she will not have the same relative difficulty constructing meaning. Such reading comprehension tasks would involve the process of assimilation. Assimilation is the process of incorporating a new idea into an existing scheme. Reading a narrative text, for example, would be more likely to make use of existing knowledge structures. It is much more likely that the material contained within such a text would fit into an existing scheme. Thus, it would not be as effortful a task, and would not require the same degree of sustained attention, as would reading an unfamiliar expository text. From these assumptions the current investigation will assess reading comprehension by using text designed to teach children new knowledge in the subject area of science.

A second model for how reading comprehension may exceed the attentional capacity of the student with ADHD is found when considering the possibility that ADHD with and without hyperactivity may be separate and unique psychiatric conditions. Recently, Barkley (1990) has suggested that ADHD with hyperactivity involves difficulty with sustained attention and impulse control. In contrast, ADHD children without hyperactivity may have more difficulty with focused attention. He suggests that this group of children, which may be similar to the ADHD Predominately Inattentive Type, have "a 'focused attention disorder' involving poor focus of attention/awareness and deficient speed of cognitive processing of information" (p. 91). These distinctions may be especially relevant to the current research given that it has purposely excluded from its sample children with predominately hyperactive symptoms.

As a "focused attention disorder" it might be expected that children with this form of ADHD would continue to have difficulty constructing meaning from a text. However, the cause of such difficulty would be different from that of children with a "sustained attention deficit" (i.e., ADHD with hyperactivity). It might be argued that children with a focused attention deficit will have comprehension failures due to difficulty organizing a text. As was mentioned in Chapter 1, such skill is an important semantic skill (Adams, 1980). Text organization involves the identification of a text's topic, and the main ideas that develop from it. In constructing a text's meaning, less important ideas are added in proper relation to the text's topic and irrelevant or unimportant information ignored. This skill relies heavily upon focused attention. While the child with a focused attention deficit may be able to sustain his or her attention to the text for an age appropriate period of time he or she may have difficulty attending to important ideas to the exclusion of less relevant ideas.

When reading an unfamiliar text a focused problem solving approach is essential to constructing an accurate interpretation of an author's intended message. Bransford, Stein and Vye (1982), for example, compare effective reading comprehension to the activities of a researcher when confronted with a new problem. It seems logical to assume that the ADHD child who has difficulty attending to and identifying the most important ideas within a text will in all likelihood have difficulty comprehending the text's underlying meaning.

Effortful Processing and the ADHD Child

A number of researchers suggest effortful or executive processing tasks to be particularly difficult for the ADHD child (Ackerman, Anhalt, Dykman, & Holcomb, 1986; August & Garfinkel, 1990; Barkley, 1990; Borcharding, et al. 1988; Douglas & Benezra, 1990; Hamlett, Pellegrini, & Conners, 1987; O'Niell & Douglas, 1991). For example, Barkley asserts:

The more complicated the task, and hence the greater its demand for planning, organization, and executive regulation of behavior, the greater the likelihood that ADHD children will perform more poorly on the task than normal children. Obviously, the symptoms of ADHD are only handicapping when the demands of the environment or task exceed a child's capacity to sustain attention, regulate activity, and restrain impulses (p. 55).

Clearly, reading to learn is a task that has the potential to "exceed a child's capacity to sustain attention." Simply reading the words within a text is, for most people, not a complicated task. In fact, Hasher and Zacks (1979) would argue that for the student with adequate decoding skill it is a relatively automatic process. However, macroprocessing of what is read is another story. With unfamiliar material, reading comprehension involves construction of new scheme (accommodation) and can be an extremely complicated and effortful process.

The ADHD child's difficulty with effortful processing tasks has been demonstrated by Douglas and Benezra (1990). In their study of memory problems associated with ADHD they report: "Across all verbal tasks, deficits became most apparent in ADDH boys on measures requiring organized, deliberate rehearsal strategies, sustained strategic effort, and careful consideration of response alternatives. This pattern suggests impaired self-regulatory or 'executive' processes" (p. 617). The authors report finding that ADHD boys made less use of elaborative mnemonic strategies. When asked what they had done to try to remember word pairs, only 33% of the ADHD boys, as compared to 52% of controls, reported using elaborative strategies such as imaging them linked together visually. Boys with ADHD typically used simple rehearsal strategies, ". . . reporting that they just repeated the pairs over and over" (p. 630)³. Douglas and Benezra conclude that the ". . . cognitive deficits associated with ADDH are attributable to self-regulatory processes that control the deployment of deliberate, sophisticated rehearsal and problem-solving strategies and sustained, repeated effort" (p. 634). These deficits would appear to include some of the very skills and strategies essential to successful reading comprehension.

August and Garfinkel (1990) also provide data that can be interpreted through the automatic and effortful processing framework. They found that from a consecutive series of 115 boys diagnosed (by a comprehensive diagnostic evaluation at a university child psychiatry outpatient department) as ADHD, 39% also demonstrated a specific reading disability. DSM III-R criteria were used in making the ADHD diagnosis. The assessment of reading disability was made based upon a method slightly modified from that established by Halperin, Gittelman, Klein, and Rudel (1984). Using this method a participant's standard score on either reading (word identification) or spelling achievement tests had to be at least 1 SD below the mean and at least 1 SD below their *Peabody Picture Vocabulary Test-Revised* (Dunn & Dunn, 1981) standard score.

Subsequent study compared the cognitive abilities of the ADHD children with a reading disability, to ADHD children who did not have a reading disability and to a control group of age range peers who did not have an ADHD. Their results were interpreted as suggesting that the ADHD child with a reading disability may have difficulty with the automatization of subskills such as naming objects, identifying letters rapidly, and associating sounds with letter strings. In contrast, the ADHD children without a reading disability exhibit normal progress in automatization of basic skills. However, these

³ The superficial or passive approach of ADHD boys to learning word pairs (Douglas & Benezra, 1990) is very similar to that described by Bransford, Stein, and Vye (1982) in their description of students who have weak reading comprehension skills. In this report they stated that the "less successful students took a much more passive approach to the problem of leaning the information. Their primary mode of study was simply to reread the passage. After rereading, they would invariably declare themselves ready for the test" (p. 145).

children had difficulty with tasks that demanded sustained and effortful processing such as memorizing rote material.

August and Garfinkel (1990) conclude that the psychometric profile of the ADHD subjects with reading disabilities included two types of cognitive deficits, one similar to that observed in pure ADHD individuals involving 'effortful' processing and the other similar to that reported in samples of pure reading disabled children involving automatization of basic skills. With reading it might be argued that these data suggest the ADHD child with a reading disability is doubly handicapped. Not only will this reader have problems with word identification skill (an automatic process in the normal reader), but he or she will also have difficulty exerting the effortful processing reading comprehension requires. On the other hand, the ADHD child without a reading disability, who may exhibit normal progress in automatization of basic skills, is likely to become a fluent decoder. However, these children would be expected to continue to have difficulty with effortful processing tasks such as reading comprehension.

The proposed research will employ aspects of August and Garfinkel's (1990) methodology to assess the effect of pure ADHD on reading comprehension. As was done by these researchers, the proposed study will obtain some of its participants from a university psychiatric clinic. Also, it will identify children with reading disabilities based upon word recognition achievement levels and a significant achievement/ability discrepancy.

Perhaps the most explicit statement regarding ADHD children and automatic/effortful tasks is found in the research of Borcharding, et al., (1988). This study compared 25 ADHD boys to 23 age-matched normal boys (recruited from the community in which the research was conducted) on verbal memory tasks. Twenty-one of the 25 ADHD participants in this study were considered to be free of learning disabilities. Three of the ADHD boys had a diagnosis of developmental language disorder and one boy had a diagnosis of mixed specific developmental disorder. Despite these diagnoses, however, these children did not differ from the other ADHD boys on measures of cognitive functioning. All boys were observed in a day school program for 2 to 3 weeks to ensure correct diagnoses. Once the diagnoses were confirmed participants were administered verbal memory tests. As requested of ADHD participants in the current research, all were free of medication during data collection. These measures included word recognition and frequency monitoring (which were viewed as automatic processing measures), and free recall of word lists (which were viewed as an effortful processing measure).

In their discussion of the study's results, Borcharding, et al. (1988) conclude: "Effortful processing tasks distinguished the hyperactive and control groups, while automatic tasks did not . . ." (p. 339). In other words, while the groups did not differ significantly on any of the measures considered to reflect automatic processing, they did differ significantly on all measures considered to reflect effortful processing. The ADHD boys scored significantly lower on all effortful processing tasks when compared to age-matched peers without this disorder. Clearly then, it would not be surprising to find ADHD children who are adequate oral readers. Such activity involves mental processes that can become automatic. However, it is expected that the ADHD child's performance on the effortful processing task of macroprocessing would necessarily be impaired relative to children who do not have this disorder.

In the proposed research it is expected that children with ADHD will have reading comprehension difficulties even though they will have adequate decoding skill. As Bransford, et al. (1982) point out, the ability to decode does not guarantee effective comprehension. Comprehension requires higher level cognitive activities. Bransford et al. state:

. . . the learner's activities are similar to those employed by good detectives or researchers when they confront a new problem. Although their initial assumptions about the significance of various facts may ultimately be found to be incorrect, the act of seeking clarification is fundamental to the development of new expertise (p. 143).

Clearly, even in the reader who finds word recognition to be an automatic task, this detective work requires effortful processing and sustained attention. However, it is possible that difficulty with this detective work may also be due to difficulties with focused attention. In other words, comprehension failure may not be due to difficulty sustaining attention, but rather due to difficulty identifying which facts within a text are significant and which are not. Regardless of the type of attention deficit, it would

not be surprising to find that while many ADHD children may become fluent word readers they may, nevertheless, have poor reading comprehension abilities.

Focused Attention and the ADHD Child

Answers to the question of how a "focused attention deficit" may affect the ADHD child are difficult to come by. There is very little research available on this topic. Barkley (1990) and Barkley, DuPaul, and McMurry (1990) suggest that these children may differ from ADHD children with hyperactivity in several important ways. They would appear to have fewer problems with off-task behavior during vigilance tasks, less aggression and impulsivity, fewer problems with peer relations, fewer *DSM III-R* symptoms, and perform poorer on measures of perceptual-motor speed. Barkley (1990) concludes that these "children may have more of a problem with memory, perceptual-motor speed or even more central cognitive processing speed" (p. 89). They are suggested to have problems with input analysis and retrieval of stored information.

As has been found to be the case for children with hyperactivity, the presence of a focused attention deficit has been found to predispose children to greater problems with academic adjustment (Barkley, 1990). Both forms of ADHD have similar rates of learning disabilities, and obtain similarly lower achievement test scores when compared to children without these disorders.

Clearly, reading to learn is a task that requires focused attention. Simply reading the words within a text is, for most people, not a complicated task. However, macroprocessing of what is read is another story. With unfamiliar material, reading comprehension involves construction of new scheme (accommodation). To be successful at this task the reader must be able to identify important ideas and ignore less relevant points.

Comprehension Monitoring

According to Schommer and Surber (1986) comprehension ". . . monitoring failure or an illusion of knowing is said to occur when the reader's self-assessment of comprehension is high but an objective measure indicates comprehension failure" (p. 353). Comprehension monitoring is a specific example of a reading task that may require successful macroprocessing and might thus be considered an effortful processing task. In fact, Adams (1980) has argued that the failure to accurately monitor reading comprehension is a result of processing a text at too shallow a level. Schommer and Surber (1986) have previously studied this phenomenon in skilled adult readers. Making use of a procedure similar to that proposed for use in the current study, these researchers found that the failure to monitor comprehension or the illusion of knowing occurred primarily when the reading level of the passage was difficult and the reader was given instructions to process the text at a fairly shallow level. As ADHD children might be expected to have difficulty with the deep or effortful processing needed to accurately monitor comprehension, it would not be surprising to find these children to have an illusion of knowing a text they had just read.

Barkley (1990) in discussing the executive processes of the ADHD child states:

ADHD children have difficulty with various aspects of rule governed behavior, including problem-solving or self-generating rules, which can interfere with tasks that require rule discovery and communication of those rules to others. Taken together, these findings indicated significant deficits in executive processes - strategies or mechanisms used by individuals to orchestrate or organize and monitor their own thoughts and behavior (pp. 78-79).

These difficulties in monitoring thoughts might be taken as a further indication that ADHD children will have difficulty monitoring whether they have comprehended what was read. In other words, part of the explanation for why these children have difficulty with macroprocessing, is that they do not accurately assess the quality of such processing. O'Niell and Douglas (1991) provide data that may offer support for such a hypothesis.

In their investigation of the study strategies and story recall of 20 attention deficit, 20 reading disabled, and 20 normal boys, O'Niell and Douglas (1991) found that when compared to reading disabled and normal boys, attention deficit boys had excessively optimistic expectancies of their ability to recall a

story that they had heard. Given the research findings suggesting that similar processes are involved in reading and listening comprehension (Smiley, Oakley, Worthen, Campione, & Brown, 1978), it would not be surprising to find that ADHD children also have difficulties with reading comprehension monitoring.