MAKING SENSE OF ATTENTION DEFICIT/HYPERACTIVITY DISORDER

by

Carol R. Lensch

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APPROVED: _________________________ _________________________

Jerome A. Niles, Co Chair  David J. Parks, Co Chair

_________________________ _________________________

Kay F. Longley  Carol Whitaker

_________________________

Dianne W. Yardley

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In recent years there has been a notable increase in the number of students being identified with Attention Deficit/Hyperactivity Disorder (AD/HD) in American schools. Although there is a tremendous amount of research being done in
the area of AD/HD, parents, educators and individuals with AD/HD are ill-equipped to deal with the demands of the disorder. Only through extensive research and a better understanding of what AD/HD is can we expect to develop more effective means of dealing with AD/HD on a daily basis at home and in school.

The primary purpose of this book is to bridge the gap between research knowledge and the knowledge in use by educators on AD/HD. The book is a review and interpretation of selected studies on the causes, co-occurrence with other disorders, diagnosis, and treatments of AD/HD. It provides the reader with the opportunity to gain an understanding of AD/HD for making mindful, informed decisions on approaches best suited to meet the challenges presented by this disorder.

Five misconceptions are identified and refuted by research presented in chapters two through five. The findings of these studies lend support to: (a) a genetic and environmental basis for AD/HD; (b) a comorbid and heterogeneous nature to the disorder; (c) a need for educators to approach AD/HD from an educational perspective; (d) the need to consider a variety of interventions in addition to medication for the treatment of AD/HD; and (e) the unique response to interventions by individuals with AD/HD.

In conclusion, educators are seeking information on this disorder because they are faced with an ever-increasing number of students with AD/HD, and they want to effectively meet the needs of this growing population of children. The emphasis in chapter six is on using a collaborative team approach, involving all persons who have an impact on the life of the student with AD/HD.
Only through knowledge, understanding, and collaboration can educators be empowered to do the job that so desperately needs to be done.
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The essential thing at the start is the habit of thinking.

- Henry Cabot Lodge -

The study of how the human brain works, especially that of children, can be both intriguing and challenging as one attempts to analyze how learning takes place. As a special educator I have had an abundance of opportunities to observe children, particularly those with special needs. Although our educational system categorizes students into groups of special education and general education, all children are special and unique in the ways they learn. An area of particular interest and concern regarding individual learning differences is that of Attention Deficit/Hyperactivity Disorder (AD/HD). Typically, an AD/HD child will exhibit excessive motor activity, impulsivity, and difficulty attending to tasks (APA, 1994).

Incidence

Over the years I have seen a growing number of students diagnosed as having Attention Deficit/Hyperactivity Disorder, and AD/HD appears to be on the increase. Between the years 1990 and 1995, the diagnosis of AD/HD has more than doubled (Turecki, 1997). This increase in identification leads one to question what
changes have taken place to bring it about and what can be done to deal with the challenges created by the increase and numbers of children with the disorder. Has the nature of the student or the tolerance of educators changed in recent years? Are there environmental or societal factors to consider? The incidence of AD/HD is estimated to be 3-5% of school-age children to as high as 12% depending on how the disorder is defined (Augustine & Damico, 1995; Patel, 1996).

The Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV), provides a detailed description of the characteristics that must be identified for a medical diagnosis of AD/HD (APA, 1994) (see Appendix A). These criteria are based on the observation of behavior and are divided into three subtypes: (1) Attention Deficit/Hyperactivity Disorder, Predominantly Hyperactive-Impulsive Type; (2) Attention Deficit/Hyperactivity Disorder, Predominantly Inattentive Type; and (3) Attention Deficit/Hyperactivity Disorder, Combined Type. Previous editions have delineated between Attention-Deficit Disorder (ADD) and Attention Deficit/Hyperactivity Disorder (AD/HD), but in keeping with the language and definition of subtypes used in DSM-IV, AD/HD will be used throughout this book.

The Diagnostic and Statistical Manual of Mental Disorders (DSM) has been revised and is now in its fourth edition. Have the criteria changed significantly? Perhaps the increase in the number of students being diagnosed with AD/HD is in part due to this inconsistency in defining the disorder. Or do we truly have more individuals with AD/HD in modern American society?
While some may believe that AD/HD is on the rise, other authorities contend that a pseudo AD/HD accounts for 50-60% of the diagnosed cases (Hallowell & Ratey, 1994). By pseudo AD/HD Hallowell means the manifestation of a set of behaviors which mimic AD/HD, but are actually the result of environmental influences such as fast food, fast-paced media and video games, and a pervasive societal attitude towards immediate gratification.

It is my belief that more physiologically based diagnostic procedures must be developed and used to identify individuals with AD/HD. Technology is being developed which can accomplish this task through a clinical, scientific approach, including magnetic resonance imaging (MRI) (Castellanos et al., 1996) and positron-emission tomography (PET) (Weiss, 1990) by identifying brain differences. Currently, these techniques are used in research settings, but as they are proven and perfected they may become part of a routine diagnostic assessment.

AD/HD is also, in part, identified through the use of teacher-rating scales, and rater reliability is a factor. Behavioral-rating scales are very subjective and depend on the rater’s tolerance and interpretation of student behavior. The use of computer software designed to diagnose AD/HD on the basis of an individual’s performance on specific tasks is one way to remove rater bias.

Pediatricians, psychologists, and other child-care professionals have limited explanation for AD/HD. The etiology or cause(s) of AD/HD is unknown at this time. There are those who believe that AD/HD is genetically transmitted, but are unable to
prove that conclusively (Biederman & Faraone, 1996). Some studies show that there is a 30-80% chance that a child of an AD/HD parent will be AD/HD (Hallowell & Ratey, 1994). Others are studying fatty acid metabolism as a causal factor in AD/HD (Stevens et al., 1995). Biederman and Faraone (1996) have done extensive research on AD/HD with their findings leading them to conclude “that AD/HD is familial, and that AD/HD is associated with environmental adversity and social disability” (On-line, p.1). In spite of the research that is going on, there is no definitive proof as to the cause or causes of this potentially handicapping condition. An analysis and synthesis of the research is needed to make sense of the findings of the studies being done.

The apparent increase in the prevalence of AD/HD and the lack of a viable explanation for this phenomenon create a need for developing reasonable explanations as to the cause of AD/HD. It is quite possible and in fact reasonable to expect that multiple causes may exist. In a quest to find answers to the many questions surrounding the cause(s) and diagnosis of Attention Deficit/Hyperactivity Disorder, taking a microscopic view seems in order. After all, studying this neurological disorder from a global, behavioral perspective has not yielded the results one would hope to attain.

The Decade of the Brain

The nineties have been declared the Decade of the Brain (National Institutes of Health, 1994). During this decade there has been an abundance of research conducted on how the human brain
functions. This is of particular interest to educators who recognize the brain as the ultimate center of learning. Brain research findings give credibility to what have previously been considered the “soft” studies of educational research (Viadero, 1996). We are now seeing a number of educational professionals and scholars synthesizing, presenting, and making connections between brain research and educational applications.

One educator who is drawing connections and expanding upon current brain theory is Robert Sylwester, author of *A Celebration of Neurons: An Educator’s Guide to the Human Brain* (1995). As the title indicates, it is written to bridge the gap between brain research and education. Sylwester believes educators are on the verge of a major professional transformation:

> The education profession is now approaching a crossroads. We can continue to focus our energies on the careful observation of external behavior—a course that may be adequate for managing relatively mild learning disorders—or we can join the search for a scientific understanding of the brain mechanisms, processes, and malfunctions that affect the successful completion of complex learning tasks. (p. 4)

Sylwester (1995) makes an analogy between medicine and education. He portrays both as having their beginnings on an operational level based solely on observation and intuition or as he calls it “professional folklore” (p. 4). Medicine grew out of this model as a result of the application of scientific research
and discovery. Education is now at the point of legitimizing itself by the same means. When I heard Sylwester speak at the Association for Supervision and Curriculum Development Conference in Williamsburg in December 1996, I could not help but get excited about the ideas that were incubating in my mind, not only because of what he said, but also because he is an educator (not a neuroscientist) just like me! Maybe it was not so out of line for me to look at the brain and causes for AD/HD from an educator’s perspective. He was suggesting a way to study learning “through the scientific understanding of brain mechanisms” (p.4) rather than through the observation of behaviors, as we have previously done.

As a species, we have moved away from reliance on our basic instincts. In more primitive times people had to rely on themselves for survival. As a result of modern conveniences and technology, our lives have changed drastically over the years. We have given up our self-reliance and developed a dependency on experts. A first course of action for most people in Western cultures when faced with a challenge is to run to someone perceived as having the answer or the fix for the problem. There are times when the expertise of a specialist is warranted, but we have given up the ownership of our own destiny by never developing our inner resources. Through reconnecting with our innerselves we can take back our inalienable right to our own lives. It is only through informed decision making that we can strive to become all that we are capable of being. We need to empower ourselves through knowledge and become experts in our own right.
Howard Gardner (1991) identifies three types of learners, and we may all fit within each of these at various points in our lives. The first is the intuitive learner which is typically the young child with a naive set of beliefs based on concrete observations. The traditional student is successful at complying with all the rules and mastering the lessons taught within the school setting. The disciplinary expert is the individual who can put it all together and through a mastery of the discipline is able to transfer and apply knowledge across settings. We are all capable of becoming disciplinary experts. Gardner says,

These individuals have sought to establish concepts and practices that provide the best possible account of the world in which we live, even when that account flies in the face of long-standing intuitions, received wisdom, or unwitting but well-entrenched stupidity. Instead of accepting the earth as flat, they have— in the spirit of Christopher Columbus— amassed evidence that it is spherical in shape. (p. 11)

We all must become informed and thus empowered to make good decisions based on the evidence that neuroscientists have amassed on AD/HD. Above all, I want the reader to leave this experience with a greater understanding of Attention Deficit/Hyperactivity Disorder and thereby a sense of empowerment which will enable the reader to make a difference in the lives of those with AD/HD that they touch.
Purpose and Format of the Book

The purpose of this book is to provide a review of research relevant to Attention Deficit/Hyperactivity Disorder as a useful guide to educators in bridging the gap between research and practice. The term educator is being used in the broadest sense, intended to include all those who participate in the lives of children with Attention Deficit/Hyperactivity Disorder. I attempt to make sense of the research findings and draw connections between otherwise isolated studies. This book is not designed to give answers to all the questions associated with AD/HD, but rather to facilitate decision making through providing information on current research in the field. It is my contention that through a review of the research practitioners and parents will be able to draw their own conclusions about the etiology, diagnosis, and treatment of AD/HD. In the final analysis these are the topics that are most salient to those of us who live and work with individuals with Attention Deficit/Hyperactivity Disorder.

For a long time I have been puzzled by the riddle of AD/HD. Through extensive reading on the subject I developed a conceptual map of the basic areas of research currently being done as well as an historical framework of previous research. Patterns emerged which served as the basis for the format of this book.

The first step towards developing an understanding AD/HD should be determining its origin. Therefore, the causes are the subject addressed in Chapter 2. It became apparent to me that this disorder is more complex than one cause or definition implies. This logically led to the next step, the study of
comorbidity (co-occurrence) of AD/HD with other disorders, which is the focus of Chapter 3.

Diagnosis is discussed in Chapter 4 to aid teachers in the understanding of the identification procedures used with AD/HD and comorbid disorders. Although educators do not make the medical diagnosis of AD/HD, they are often involved in the process. Intervention is probably the area most relevant to teachers as it has direct application to the classroom. Chapter 5 is a review of some effective practices for use by teachers with students with AD/HD.

In chapter 6, I have come full circle returning to some of the basic questions that have influenced the format of this book. Chapters 2 through 5 each grew out of a quest to find answers to the riddle of AD/HD. Misconceptions have developed regarding the cause, complexity, diagnosis and treatment of the disorder. It seems fitting that at the end of our journey through a review of research on these topics I attempt to dispell the misconceptions. In the last chapter I try to make sense of the research in a way that I hope is useful to educators.

To aid the educator in applying this information to meaningful practice, suggestions are given for working together collaboratively in learning communities. The roles of the team members are defined in terms of their relationship to one another.

Article Selection and Organization

There is a wealth of research being done on AD/HD. To narrow the selection I chose articles from journals that referee
(reviewed by experts) submissions before approving them for publication (see Appendix B). To locate articles, I conducted library and Internet searches; scanned reference lists in books and articles; attended conferences where experts presented papers on their research findings; and reviewed articles and books suggested by colleagues and friends. Through the use of a large matrix, I categorized the articles by topic and this resulted in the formation of the chapters.

Next, I evaluated the articles for relevancy to educators. I defined relevancy as contributing to a basic understanding of AD/HD to enhance communication with parents and other professionals, to facilitate decision making, and having a direct application to teaching children with the disorder. A panel of readers was formed to provide feedback on the relevancy and readability of each chapter (see Appendix C).

Each article was evaluated in terms of the research cited by the authors and whether the study supported and reflected the general findings of the literature. I carefully reviewed each article to see if the author(s) cited other researchers who were reputable. After having read many studies and books on the subject of AD/HD, I have become familiar with the names and work of many researchers in the field. Next, I evaluated each study to determine if the author’s findings were supported by the findings of the researchers they cited. I felt that it was important that the studies I reviewed reflect a broad, well-established body of literature.

Once I put each chapter together I sent copies to my panel of
readers that consisted of an elementary school principal, a middle-school English teacher, and a high-school special education teacher. Based on their comments I made revisions and added anecdotes. There are places throughout the book where I have used italics to distinguish my words from the words of those whom I was citing. A child psychiatrist who has expertise in the area of AD/HD reviewed chapters 2-4 and provided feedback (see Appendix D).

Chapter 5 has been approached differently due to the fact that there are a number of older interventions that have been well researched. Therefore, the categories of established techniques are reviewed and current research is cited where it contributes to the existing body of knowledge. The educational interventions are presented, for the most part, in chronological order to represent the evolutionary development of these interventions.

The articles included in this book have been selected to (a) stimulate thinking on the subject of AD/HD, (b) provide an indication of the trends in current research, (c) correct misconceptions about the disorder, (d) facilitate mindful-decision making on the part of educators, and (e) enable educators to communicate knowledgeably with parents and other professionals regarding AD/HD.

The conceptualization of AD/HD is evolving. Although a great deal of research has been conducted in the area of AD/HD over the years, there has not been a consistent definition of the disorder (Barkley, 1990). For that reason some of the findings may be contradictory at this stage of development. Researchers can only
report the results as they emerge, and the confusion will probably continue until there is a greater understanding of AD/HD. As with any scientific endeavor, much trial and error will no doubt precede illumination about the mechanisms at work in AD/HD.

Whenever research involves human subjects there are constraints on the nature of the studies that can be conducted. The majority of research related to AD/HD has been nonexperimental and therefore limited in the generalizations that can be made from the findings. In Appendix B, each study is identified as nonexperimental, quasi-experimental, and experimental to give the reader an indication of the types of studies being conducted and included for review. Definitions for nonexperimental, quasi-experimental, and experimental are provided in Appendix B.
REFERENCES


Studies on the Cause(s) of Attention Deficit/Hyperactivity Disorder

In order to understand Attention Deficit/Hyperactivity Disorder it is essential that one understands the underlying causes. When we form opinions based on observations alone, we may jump to erroneous conclusions. Because AD/HD is primarily recognizable by behavioral manifestations, it is easy to see why some people assume that these behaviors are learned and controllable. Such behaviors are often blamed on poor parenting or a lack of discipline. The assumption is sometimes made that if a child can sit still to watch a favorite T.V. show, then it is within the child’s ability to control the behavior in other situations. By reviewing the evidence of a neurological origin of AD/HD readers can reexamine their own beliefs on the nature of the disorder and be able to speak about and approach the subject from a more informed and mindful position.

For a period of time it was theorized that excessive motor activity and impulsivity were caused by diet. One of the more well known treatments along these lines is the Feingold Diet, which although successful with a small percentage of children, has
not been supported by research findings (Gross, Tofanelli, Butzirus, & Snodgrass, 1987; Mattes & Gittelman, 1981).

Even though the misconception persists that AD/HD is the result of permissive parenting or junk food diets, numerous studies have been done that indicate a neurological basis for the disorder. However, socio-cultural factors such as parenting and diet may contribute to the expression of AD/HD and associated disorders.

Attention Deficit/Hyperactivity Disorder is not a new phenomenon. Although the labels and theories may have changed over time, AD/HD has long been recognized as a dysfunctional condition occurring in some children. As far back as 1890, William James proposed that the characteristics we now associate with AD/HD in children had a neurological basis. At the beginning of the 20th Century research began on this complex disorder and has continued and increased tremendously in recent years (Barkley, 1990).

Due to the complex nature of AD/HD it has been difficult for researchers to identify a specific cause or causes for the disorder. Therefore, in spite of the extensive studies that have been conducted, there is no known cause, but there are a number of theories with some modest or isolated support. The following reviews are a sample of current research studies and findings regarding genetic and environmental causes and the debate over nature vs. nurture. There are also studies cited which indicate that there may be specific physical differences, particularly in the brain, between individuals with and without AD/HD.
Genetic Factors

1. **Evidence of Familial Association Between Attention Deficit Disorder and Major Affective Disorders.**


   The subjects in this study were white males between the ages of 6 and 17 years. There were 73 individuals with Attention Deficit Disorder (ADD) and 264 of their relatives; 26 without ADD and 92 of their relatives. Thirty-three percent of the subjects with ADD also met the criteria for Affective Disorders (AFF) which included depression, Bipolar Disorder, and Mood Disorder. All subjects had an I.Q. of at least 70. The purpose was to see if there was a relationship between the occurrence of Attention Deficit Disorder and major affective disorders within families to determine a genetic link.

   Two environmental factors were considered for possible relevance (social class and intactness of family), and neither was found to be associated with an increased risk of affective disorders in subjects with ADD or their relatives. It appears that ADD and Affective Disorders may have a common etiological basis, which means that whatever causes one may also cause the other. The findings from this study are based on clinically referred subjects that are typically more severely ill than nonreferred subjects; therefore, the results cannot be generalized to the population at large.

   It was found that relatives of children with Attention
Deficit Disorder and Affective Disorder were at a greater risk of having either of those disorders than relatives of normal individuals. The implication are there for the need to develop early intervention programs for youth at risk of having Attention Deficit Disorder and Affective Disorder. The authors suggest that further research needs to be done to determine the nature of the familial relationship between ADD and Affective Disorder, as well as any environmental factors that may come into play.


Biederman has been involved in extensive research on AD/HD, particularly its occurrence within families and the co-occurrence of AD/HD with other disorders, such as Conduct Disorder, Mood and Anxiety Disorder, and Antisocial Disorder. Along with an increased risk of AD/HD among relatives, there also appears to be an increased risk for one of the associated disorders along with AD/HD. In spite of the fact that most of the research has focused on male subjects, there is some evidence that indicates that relatives of females with AD/HD are also at a higher risk of AD/HD.
as well as anxiety, antisocial and depressive disorders, than relatives of non-AD/HD individuals. Due to the co-occurrence of other disorders with AD/HD, studying the disorder is complicated by the variety of combinations that may occur.

In this study the researchers explored the relationship between the occurrence of AD/HD within families and that of other psychiatric disorders to determine if distinct subgroups exist. They also considered whether or not AD/HD is associated with a genetic vulnerability for associated disorders. In other words, they evaluated the increased risk for anxiety disorders, Conduct Disorder, and Mood Disorder in individuals with AD/HD. The study involved 140 children with AD/HD, 120 normal children and their 822 first-degree relatives (parents, brothers, and sisters). Data were gathered through the use of structured interviews with parents, siblings, and subjects, except children under 12 years of age. Socioeconomic status (SES) was controlled by excluding the lowest category (SES-VI). Subjects with major sensorimotor handicaps, psychosis, autism, or I.Q. scores below 80 were also excluded.

Although socioeconomic status and family intactness are recognized as influential factors, they did not account for the risk of AD/HD and other disorders within families, except in two instances. After controlling for SES, both the risk for Conduct Disorder (CD) (see Appendix E for APA definition) and substance dependency could not be explained by family-genetic factors. The interaction between genes and environment is a factor that cannot be overlooked. One’s place within the family, peer relationships,
and parental separation or divorce and the resulting impact on income and residence are all environmental family factors that may increase the risk of Conduct Disorder and substance dependency in children with AD/HD. It is also possible that Conduct Disorder with AD/HD may be a distinct subtype of AD/HD.

In conclusion, Biederman and colleagues believe that their findings in this study lend further support to previous findings of a genetic cause of AD/HD and selected associated disorders. They also recognize the complexity of the disorder and suggest that AD/HD is “a group of conditions” rather than one distinct disorder. Therefore, a number of causes may exist. Continued research is necessary to validate the subtypes, and their causes, including a closer look at environmental factors.


Definition of Terms
heterogeneity: a quality or state of being heterogeneous (Merriam-Webster, 1987, p. 568).
heterogeneous: consisting of dissimilar or diverse ingredients or constituents; MIXED (Merriam-Webster, p. 568).
comorbidity: co-occurrence with other conditions (Castellanos, 1997a).

Teachers are familiar with heterogeneous reading groups in which there is a mixture of students with diverse or varying reading ability levels. In the context of this article heterogeneity refers to the variation of characteristics and combinations of conditions occurring with AD/HD. As one would imagine, the more complex the disorder the more difficult it is to study it. This is the case with AD/HD, and it seems that the more we study it the more complexities we discover.

The authors of this study attempted to unravel some of the confounding aspects of AD/HD by studying how gender and the presence of antisocial disorders might affect siblings of boys with the disorder. Families were considered antisocial if either the subject or a parent had Antisocial Personality Disorder which is characterized by “a pattern of covert antisocial acts such as fire setting, truancy, stealing, and vandalism” (Barkley, 1990, p. 165). “The diagnosis of Antisocial Personality Disorder cannot be given to individuals under age 18 years” (APA, 1994, p. 90).

Faraone, et al. found that boys from antisocial families with mothers diagnosed with AD/HD are at the greatest risk for AD/HD. The risk for AD/HD is the same between brothers and sisters from families that are not antisocial. There may be a distinct genetic subtype of AD/HD with Conduct Disorder (CD) (see Appendix E for APA definition) that occurs in antisocial families, whereas, individuals with AD/HD from nonantisocial families are at a
greater risk for depression and Oppositional Defiance Disorder (ODD) (see Appendix F for APA definition).

4. **Attention Deficit-Hyperactivity Disorder in People with Generalized Resistance to Thyroid Hormone.**


Symptoms of AD/HD are often seen in individuals with generalized resistance to thyroid hormone. This is a disease in which a mutation in a thyroid gene renders tissues less receptive to thyroid hormone. Eighteen families with a history of generalized resistance to thyroid hormone were included in the study. Within these families 49 members were affected with generalized resistance to thyroid hormone, and 55 were unaffected. There were 52 adults and 52 children. Structured interviews were conducted to determine if the subjects met the criteria for AD/HD.

The adults with the thyroid disorder were 15 times more likely to have AD/HD; children with the thyroid disorder were 10 times more likely to have AD/HD. All of the subjects in the study had similar genetic and environmental backgrounds, except for the receptor gene mutation in the family members affected with generalized resistance to thyroid hormone. In addition, the researchers found that the risk for AD/HD for males in both groups (affected and unaffected with thyroid disorder) was three times as
great as that of the females. This lends support to the general belief that AD/HD is more prevalent among males than females.

The thyroid receptor gene may play a role in brain development, particularly during critical prenatal stages. It may also influence the development and interaction between neurotransmitters involved in AD/HD in the human brain. A neurotransmitter is a chemical in the brain that relays messages. One implication of the findings in this study is that less overt thyroid dysfunction may be underlying AD/HD in cases that otherwise seem unrelated, such as low secretion of thyroid hormone. Another implication is for the use of thyroid hormone in the treatment of AD/HD in the appropriate situations. It is important to keep in mind that this research looks at the chemical interactions in the brain in relation to the mutated thyroid gene as a cause of AD/HD behaviors, not the behaviors related to a lowered secretion of thyroid hormone which might be quite different.

Letters to the Editor


In a letter to the editor, Bhatara et al. emphasize the point that since thyroid dysfunction is associated with cognitive functioning, teachers may be the first ones to witness the onset
of academic difficulties. For this reason, they contend, teachers must be aware of the importance of a medical referral in such cases.


Even among researchers there is some debate over whether AD/HD is caused by genetics or environment. Joseph Biederman and Stephen Faraone have conducted numerous studies on AD/HD, several of which are cited above. Although the focus of their research has primarily been on genetic causes for the disorder, they have also done some studies on environmental factors, as cited below.

In the Letters to the Editors column of the *American Journal of Psychiatry*, Diller, Tanner, and Weil criticize Biederman and Faraone for overemphasizing genetics at the expense of environment as causal factors, and for the resulting implication that medication is therefore the only treatment. They also point out some perceived flaws in the research design that uses telephone interviews, which in their opinion contributes to the over diagnoses of AD/HD.


Within the same issue of the journal, Biederman and Faraone responded to the comments made by Diller et al. by criticizing their limited thinking. In their rebuttal Beiderman and Faraone clarify their findings regarding environment vs. genetics and
recognize the need for more research on environmental factors.

As we review the research it is important to keep in mind the fact that even the researchers are debating and grappling for answers regarding the cause or causes of AD/HD.

Environmental Factors


Milberger et al. compared 140 boys between the ages of 6 and 17 who were diagnosed with AD/HD with 120 normal boys of the same age, and the first-degree biological relatives of both groups of subjects. A standardized rating system was used to gather information on the mother’s smoking habits during pregnancy. It was found that in the group being studied only 8% of normal subjects had mothers who smoked during pregnancy while 22% of the AD/HD children were exposed to maternal smoking during pregnancy. The results also indicated significant I.Q. differences between the children of mothers who smoked during pregnancy and those who did not (with an average I.Q. score of almost 11 points lower for the children of smoking mothers).

Animal studies using pregnant mice and rats support the association between chronic exposure to nicotine and increased activity in the young. In the study of children, chronic exposure
was defined as being at least three months in duration.

The authors were concerned about other variables affecting the results, such as parents’ I.Q., parental AD/HD and the socioeconomic status (SES) of the family. Compared to the normal control group, AD/HD subjects were from families with a slightly lower SES, had a higher incidence of mothers and fathers with AD/HD and with lower I.Q.s. However, when these factors were taken into account there was still a significant association between maternal smoking and AD/HD.

Low birth weight, which has been associated with maternal smoking during pregnancy, was not considered to be an influencing factor in this study as none of the children exposed to maternal smoking were of low birth weight or under five lbs. at birth. Ruling out this factor lends further support to the findings associating maternal smoking with lower cognitive function and AD/HD.

Limitations of this study include the difficulty involved in obtaining accurate and unbiased reflective accounts from the mothers of their smoking habits during pregnancy; the authors did not account for prenatal exposure to secondhand smoke; and the subjects with AD/HD had been selected on the basis of their clinical referral; therefore, the results cannot be generalized to the general population.

In conclusion, the authors indicated a possible AD/HD risk associated with maternal smoking with implications for additional research to confirm these findings as well as programs focusing on smoking prevention or cessation for mothers during pregnancy.

**Definition of Term**

sequelae: an aftereffect of disease or injury
(Merriam-Webster, 1987, p. 1073)

The purpose of this study was to examine the relationship between low birth weight (LBW) and AD/HD. The subjects, 473 low birth weight and 350 normal birth weight (NBW) children, were randomly selected from both urban and suburban hospital records. Through the use of parent and child interviews, behavior rating scales by teachers, and a thorough neuropsychological evaluation of the children, the subjects were diagnosed for Anxiety Disorder [characterized by excessive worry and anxiety (APA, 1994)], Oppositional Defiant Disorder (ODD) (see Appendix F for APA definition), overanxiousness and AD/HD. Both mothers and children were evaluated for I.Q.

The results suggested an association between low birth weight and AD/HD, but not the other childhood disorders such as Anxiety Disorder and Oppositional Defiant Disorder, and the association was stronger in urban population than in suburban populations. The authors excluded children with severe disabilities. There was a higher rate of AD/HD among low-birth-weight subjects with lower
I.Q. scores than subjects with average or above I.Q. scores. With I.Q. levels at or above 100 the likelihood of an AD/HD diagnosis was the same for low-birth-weight as normal-birth-weight children.

The authors noted the beneficial effects a suburban environment might have on a child, thus mitigating the risks of AD/HD in that group of children. In addition, mothers in suburban settings may have underreported the symptoms of AD/HD, but this should have been corrected for by the teacher rating scales. Due to the fact that data on family histories were not available, there may be other unidentified factors which predispose a child to AD/HD, and low-birth-weight increases the risk. Further research is needed to address family vulnerability and AD/HD.

Physiological Brain Differences

In this section brain differences are addressed in support of a physiological basis for AD/HD, but no attempt is made to establish a causal relationship between these differences and AD/HD. Such a relationship has not been established through research findings. The reader needs to keep this in mind when reading this section and not assume that the authors are implying a causal relationship.

**Definition of Terms**

*sequelae*: an aftereffect of disease or injury (Merriam-Webster, 1987, p. 1073).

*ultrasound*: vibrations of the same physical nature as sound but with frequencies above the range of human hearing (Merriam-Webster, 1987, p. 1280).

*ultrasonography*: a diagnostic technique for the examination of internal body structures (Merriam-Webster, 1987, p. 1280).

*Psychiatric disorders (outcomes)* in this study include, but are not limited to, Attention Deficit/Hyperactivity Disorder, Tic Disorders, Oppositional Defiant Disorder, Obsessive-Compulsive Disorder, and nocturnal enuresis (bed-wetting).

Through the use of ultrasonography it is now possible to study low-birth-weight (LBW) newborns for brain damage and its effects on later behavioral manifestations or psychiatric outcomes. The purpose of this study was to see if there were detectable brain differences in children who were later identified as having some type of psychiatric disorder, including AD/HD. The subjects were a group of low-birth-weight babies born over a 2 1/2
year period. An ultrasonography was done within a week of birth to determine if there were any brain abnormalities. A follow-up evaluation was done on the same group of children at six years of age to determine if they had any of the psychiatric outcomes previously mentioned.

The results showed that 80% of the children in the sample had normal ultrasonography readings indicating that no brain abnormalities were detected. For the remaining children, differences were found in specific locations in the brain. Within the entire sample, 22% had at least one psychiatric disorder, with most having more than one disorder. AD/HD was the most frequently occurring disorder. Boys had a much higher incidence than girls for any of the disorders.

The researchers looked at other indicators of psychiatric disorder other than brain abnormalities identified by ultrasound. They found that the risk of psychiatric outcome was increased by maternal smoking, male sex, and social disadvantage in the child’s immediate environment. These factors have been identified and supported by previously reviewed studies within this chapter.

In conclusion, the findings of this study suggest a relationship between specific types of damage to the brain that may accompany low birth weight and the occurrence of AD/HD, and it appears that the risk may be increased by gender, maternal smoking, and social disadvantage in the immediate environment.

10. Association of Attention-Deficit Disorder and the Dopamine Transporter Gene. Edwin H. Cook, Mark Stein,
Definition of Terms

dopamine: neurotransmitter; brain messenger (Castellanos, 1997a, p. 34).
dopamine transporter: a chemical which facilitates the reabsorption of dopamine (Castellanos, 1997a).
synapse: the point at which a nervous impulse passes from one neuron to another (Merriam-Webster, 1987, p. 1196).
neuron: a nerve cell (Castellanos, 1997a, p. 31).

Dopamine, a chemical in the brain which relays messages, has been implicated as an area of possible dysfunction in AD/HD. Typically, dopamine is broken down quickly after it is released in the body. If for some reason the breakdown and reabsorption is delayed, it is theorized that high levels of hyperactivity, inattention, and impulsivity result. Due to the success of medications which regulate the reabsorption of dopamine in patients with AD/HD, the authors of this study were interested in the part dopamine plays in the disorder. Coming from the perspective that AD/HD is familial, they designed their study with a focus on families with AD/HD and administered intelligence tests, behavior rating scales, and DNA testing. The family units consisted of the mother, father, and the affected child or children.

Cook et al. concluded that, although these results need to be
replicated to determine if there are any defective gene patterns, there appears to be some association between mutations in the dopamine transporter gene and the manifestation of AD/HD within families. This is an indication of a difference in brain chemistry among individuals with AD/HD and those without the disorder, and it reinforces the theory of heritability.


The purpose of this study was to determine if essential fatty acid (EFA) is associated with Attention Deficit/Hyperactivity Disorder in boys. Essential fatty acid plays an important part in the structure and function of the cells in the human body. Subjects included in the study consisted of boys with AD/HD and a control group of healthy boys (all between the ages of 6 and 12 years). The AD/HD diagnosis was confirmed through parent and teacher completion of behavior rating scales. Essential fatty acid levels were determined by blood tests.

**Results**

AD/HD subjects had lower levels of essential fatty acid than controls. In addition, they had some of the symptoms of essential fatty acid deficiency, such as thirst (greater fluid intake), more
frequent urination, and drier skin than the control group. If there is a subtype of AD/HD associated with essential fatty acid deficiency, these students may be genuinely thirsty and need to use the restroom more often than other students, rather than just displaying these behaviors as an excuse to leave the room. It has been my experience that some students with AD/HD more frequently requested drinks of water and restroom "passes". I typically attributed this behavior to their short attention spans and restless energy, but this study points out some other factors that we as teachers need to be cognizant of in meeting the individual needs of our students.


Some studies have indicated a possible association between deficiencies in zinc and essential fatty acids (EFA) and hyperactivity or maladjusted behavior. There has also been a great deal in the press in recent years about serotonin and melatonin and their effects on mood and behavior. In a quest for answers about how the brain functions, scientists have been studying the actions and interactions of chemicals in the brain. For example, zinc and fatty acids are believed to influence the
production of serotonin and melatonin which in turn affect dopamine function. So it seems reasonable to study deficiencies in zinc and essential fatty acid in relationship to AD/HD.

Other studies have linked both zinc and essential fatty acid, individually, to hyperactivity (see previous study, #11). These authors looked at the levels of both elements in patients with AD/HD. The research was conducted by establishing a diagnosis of AD/HD for the target group and by analyzing free fatty acid (FFA) and zinc levels from blood samples. The subjects included boys and girls between the ages of 6 1/2 and 12 years.

The authors’ hypothesis was confirmed by findings that children with AD/HD had significantly lower levels of zinc and free fatty acid than the control group. It is not clear whether the zinc deficiency is responsible for the lowered free fatty acid levels; further studies are needed to establish free fatty acid as a primary or perhaps secondary cause of AD/HD.

As educators we should be aware of reports of poor response to stimulant treatment (i.e., Ritalin and Cylert) on the part of AD/HD children diagnosed with zinc deficiencies (Bekaroglu et al., 1996). This is another example of the heterogeneous nature of Attention Deficit/Hyperactivity Disorder and why some students do not seem to respond to the typical medications prescribed for the disorder. The implications are clear for the need on the part of teachers to not only have a better understanding of the biological basis of AD/HD, but also to take a team approach, working collaboratively with parents and physicians, in dealing with treatment and interventions.
Magnetic Resonance Imaging and Physiological Brain Differences

The following three studies involve the use of magnetic resonance imaging (MRI) as a research tool. Magnetic resonance imaging is a nonintrusive method of studying anatomy or, in these three cases, the human brain by obtaining high resolution images. This technique does not expose the subject to dangerous radiation and therefore can be used safely with children. Specific sites in the brain have been implicated in AD/HD, and through the use of MRI, abnormalities at these sites can be identified (Ernst, 1996).


“Executive functions have been defined as ‘control processes...[involving] inhibition and delay of responding [allowing an individual to] initiate, sustain, inhibit/stop and shift.’ Also associated with the construct of executive function are the abilities to prioritize, organize, and strategize.”

(Castellanos, 1997b, p.4)

*Any teacher who has worked with a student with AD/HD has witnessed a deficit in one or more of the areas identified as*
executive functions. Such students typically have difficulty shifting from one activity to another, controlling impulsive behaviors (most commonly seen as calling out answers), and with organizational skills. These very behaviors are what educators find most challenging in the classroom. Castellanos et al. conducted a comparison of male subjects with AD/HD and those without looking for differences in brain structure and size in the areas of the brain associated with executive function. The methods used consisted of magnetic resonance imaging scans to measure brain volume and symmetry of all the subjects. They hypothesized that there would be differences between the two groups corresponding to deficits in executive function in the AD/HD group.

Asymmetry (a difference in measurement or proportion between two sides) is normal in the human brain. It has been found in this and other studies that the degree of asymmetry for boys with AD/HD is less than that of the ‘normal’ control group of non-AD/HD boys. In addition, these authors report a smaller brain volume in subjects with the disorder. These differences in symmetry and size may account for the manifestation of behaviors associated with deficits in executive function.

It is essential that teachers understand that anatomical differences may be associated with the behaviors exhibited by students with AD/HD. If the condition has a physiological basis, it may not be within the student’s power to control undesirable behaviors. More research is necessary in this area, especially through studies that include female subjects. The issue of
gender, which will be discussed later in this chapter, is identified as an area for future study by these authors.


The previous study by the same leading authors, published in 1994 (see #13), focused primarily on the caudet nucleus. In an attempt to measure a wider range of brain regions, Castellanos et al. used MRI to determine if there were structural differences associated with AD/HD.

The results of both studies were similar in that the subjects with AD/HD had smaller overall brain size and differences in asymmetry when compared with non-AD/HD controls. The authors feel the results of this research lend support to a physiological basis for AD/HD based on structural brain differences. The subject group consisted of males only and the findings cannot be generalized to females.
Gender Differences

Although gender is not actually a causal factor in AD/HD, it is included in this chapter as a biological/physiological difference. There may be variations in the manifestation of AD/HD between males and females, which could influence the selection of interventions. An awareness of the differences or similarities between males and females with AD/HD may be beneficial to educators in evaluating which intervention to implement for a specific student.

The relationship between gender differences and AD/HD has been identified as an area needing more research. There are not many studies available for review. In the study that was selected, the authors reviewed eighteen other studies on gender and AD/HD. By using this method of review, the authors are able to present an overview of the findings. It is also an indication of the limited amount of research that has been done.


The overwhelming majority of research on AD/HD has been conducted on male subjects. The reason for this is that the disorder has been observed to occur more frequently in males, and it is also a way to limit the number of variables in each study (Ernst, 1996). However, the research findings may be different
for females, and if girls are not included in the studies, then the findings cannot be generalized to include them.

Gaub and Carlson conducted a meta-analysis of research on gender differences in AD/HD. A meta-analysis is an analysis of a number of studies which focus on the same question and use similar variables (Ary, Jacobs, & Razavieh, 1996). Due to the limited amount of research that has been done on gender and AD/HD, the authors had difficulty finding appropriate studies. They were able to find 18 studies which met their criteria for size and selected variables. Therefore, by reviewing this meta-analysis we are able to review the cumulative results of a group of studies rather than just one isolated study.

The results have significant implications for educators. There are distinct differences between girls with AD/HD who have been clinically referred and girls with AD/HD who have not been clinically referred when compared to boys with AD/HD. The following chart outlines the results of the meta-analysis.

**Clinically Referred Girls With AD/HD**

Girls (compared to Boys)
- lower levels of hyperactivity
- fewer diagnosed with conduct disorders
- lower rate of externalizing behavior (acting out behaviors)
- greater intellectual impairment
- greater severity of inattention

Similar Levels of:
- internalizing behavior
- aggression toward peers
• disliking peers

Nonreferred Girls with AD/HD

Show less impairment than boys on:
• inattention
• internalizing behaviors
• aggression toward peers
• disliking peers

Both boys and girls with AD/HD were characteristically of a lower socioeconomic status (SES) than non-AD/HD children, but girls with AD/HD were of a lower SES than boys with AD/HD, or, in other words, they were found to be at a greater social disadvantage.

The results of this analysis suggest that girls with AD/HD are more likely to have learning problems while boys with AD/HD are more likely to exhibit behavior problems. Within a structured learning environment, behavior problems probably lead to more referrals, whereas learning problems are probably addressed within the context of the school setting. This may partially account for a lower referral rate of girls for clinic-based treatment. Since AD/HD may present itself differently in girls and boys, how we respond to our students will no doubt vary also.

The authors identified some limitations in their study, including the small number of studies available addressing gender differences and AD/HD. There was also the constraint of having primarily clinically referred populations from which to draw results. Since girls are less likely to be referred to a clinic, those females included in the research are probably more severe, atypical cases. The differences between clinically referred boys
and girls were minimal, but the girls in this category are not necessarily representative of the majority of girls with AD/HD; therefore, the results are not widely generalizable.

Gaub and Carlson feel that the results of their meta-analysis should be used with caution and strongly recommend that more research be done addressing the nature of AD/HD in girls. This caution is particularly pertinent to educators who must keep gender differences in mind when working with AD/HD students. We cannot generalize the research findings with disregard for gender and severity, but must be mindful and observant of individual differences among our students.

Chapter Summary

The fifteen studies reviewed in this chapter are representative of the research that is being done in the areas identified as causal or differences associated with AD/HD. This is by no means considered a comprehensive coverage of the research. However, through this review we as educators should be better prepared to speak knowledgeably to others on the subject. In addition, we should be able to develop our own beliefs on the nature of the disorder. Although the review may not be comprehensive, there is nevertheless an abundance of information to synthesize. In an effort to provide an easy to read format, I have summarized the purpose, results, and implications of the studies in Table 1. Educators can, at a glance, see what each study indicates in relation to meaningful interactions with individuals with AD/HD and their families.
As illustrated in the chart: (a) four studies address genetic factors, (b) two articles deal with environmental factors, (c) physiological differences are reviewed in six studies, and (d) only male subjects were used in seven cases and both genders were represented in four studies. Although the research has been categorized into specific areas for organizational purposes, there is a great deal of overlap between the research in each of the areas. It is difficult to study genetics without considering environmental influences or physiological differences without taking genetic factors into account. Thus, we are only beginning to see the complexity of the disorder, and much more research is needed to truly understand what causes AD/HD. At least as educators we can begin to put the research in perspective and recognize the importance of keeping informed on current findings to enhance our effectiveness in the classroom and with parents and other professionals.
<table>
<thead>
<tr>
<th>Topic/Purpose</th>
<th>Interpretations</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GENETIC FACTORS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Genetic link between AD/HD and Affective Disorder</td>
<td>Found a relationship between occurrence of AD/HD &amp; Affective Disorder within families</td>
<td>Need for early identification &amp; intervention to improve outcome</td>
</tr>
<tr>
<td>Male subjects only</td>
<td></td>
<td></td>
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<tr>
<td>2. Familial-genetic cause for AD/HD and associated disorders</td>
<td>-Hypothesis supported complexity of disorder -Environmental factors -Conduct Disorder with environments impact</td>
<td>-Further support of a genetic basis -Need to consider environments impact AD/HD may be a subtype on AD/HD students</td>
</tr>
<tr>
<td>Male subjects only</td>
<td></td>
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<tr>
<td>3. Gender, comorbidity, and maternal AD/HD as factors in AD/HD</td>
<td>-Reinforces Conduct Disorder with AD/HD as subtype -Considers environmental and family factors</td>
<td>Heterogeneity of disorder means confounding factors &amp; need to consider individual differences</td>
</tr>
<tr>
<td>Male subjects only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Relationship between generalized resistance to thyroid hormone and AD/HD</td>
<td>-Results indicate adults with thyroid disorder are 15 times more likely to have AD/HD; children 10 times more likely -Use of thyroid hormone suggested for AD/HD when indicated</td>
<td>-Reinforces physiological basis for AD/HD -Suggests another treatment in cases of generalized resistance to thyroid hormone for doctors to consider</td>
</tr>
<tr>
<td>Male and female subjects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Letter to editor</td>
<td>Emphasizes role of educator in identification</td>
<td>Teachers may be the first to observe academic difficulties which are due to thyroid dysfunction -Awareness of need for medical referral</td>
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<td></td>
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<tr>
<td>6. Letters to editor: Nature vs. nurture in AD/HD etiology</td>
<td>-Need for more research on genetics and environment -Debate between researchers</td>
<td>Educators should be aware of possible multiple causes of AD/HD; researchers still unsure</td>
</tr>
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</table>
### Table 1 (Continued)
Summary of Results of Studies on Causes

<table>
<thead>
<tr>
<th>Topic/Purpose</th>
<th>Interpretations</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENVIRONMENTAL FACTORS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Maternal smoking during pregnancy as a risk factor in AD/HD</td>
<td>-Lower amount (8%) of maternal smoking during pregnancy for normal subjects&lt;br&gt;-Higher amount (22%) for AD/HD group, and</td>
<td>Educational efforts at smoking prevention and cessation for mothers during pregnancy&lt;br&gt;Male subjects only</td>
</tr>
<tr>
<td>8. Examines relationship between low-birth-weight and AD/HD</td>
<td>-Suggests association between low-birth-weight and AD/HD&lt;br&gt;-Stronger association in urban than suburban populations</td>
<td>Teacher awareness of risk factors may lead to early identification and intervention&lt;br&gt;Male and female subjects</td>
</tr>
<tr>
<td><strong>PHYSIOLOGICAL BRAIN DIFFERENCES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Relationship between low-birth-weight ultrasound abnormalities and AD/HD</td>
<td>-Associates AD/HD with low-birth-weight and ultrasound abnormalities&lt;br&gt;-Additional risk factors include maternal smoking, male sex, social disadvantage</td>
<td>Awareness of association between brain and AD/HD&lt;br&gt;Male and female subjects</td>
</tr>
<tr>
<td>10. Genetic influence on dopamine and AD/HD</td>
<td>-Supports genetic basis for AD/HD&lt;br&gt;-Neurotransmitter activity impacts upon AD/HD manifestation</td>
<td>Awareness of familial factors in AD/HD</td>
</tr>
<tr>
<td>11. Association between essential fatty acid levels and AD/HD</td>
<td>-AD/HD subjects had lower essential fatty acid levels&lt;br&gt;-AD/HD subjects had some symptoms of essential fatty acid deficiency: thirst, frequent urination, with dry skin.</td>
<td>Sensitivity to need for more frequent drinks of water and use of restroom&lt;br&gt;Awareness of signs of essential fatty acid deficiency with AD/HD for possible medical referral&lt;br&gt;Male subjects only</td>
</tr>
<tr>
<td>12. Deficiencies in zinc &amp; essential fatty acid associated w/AD/HD</td>
<td>Lower levels of zinc and essential fatty acid in AD/HD group</td>
<td>Children with zinc deficiencies typically do not respond to amphetamine treatment</td>
</tr>
</tbody>
</table>
### Summary of Results of Studies on Causes

<table>
<thead>
<tr>
<th>Topic/Purpose</th>
<th>Interpretations</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male and female subjects</td>
<td>for AD/HD. If a student is not responding to medication (Ritalin/Cylert) it may be due to a zinc deficiency and the teacher should communicate this to the child’s physician.</td>
<td></td>
</tr>
</tbody>
</table>

#### MAGNETIC RESONANCE IMAGING STUDIES

| 13. Executive function and brain abnormalities | Less than normal asymmetry and brain volume in AD/HD subjects | Awareness of role executive function plays in classroom performance (impulsivity, organization, & study skills) |
| Male subjects only | | | |

| Male subjects only |
| Subjects with AD/HD had smaller brain size and differences in asymmetry | Awareness of a physiological basis for AD/HD; enhanced communication w/ parents |

#### GENDER DIFFERENCES

| 15. Meta-analysis of gender and AD/HD | -limited # of studies -Girls showed greater intellectual impairment -Boys greater behavioral problems | -Teachers should be aware of gender differences in AD/HD -Do not over generalize these findings as more research is needed |
| | | | | | | | | | | | | | | | | | |
REFERENCES


Psychiatry, 48, 633-642.


3

Studies on the Comorbidity of Attention Deficit/Hyperactivity Disorder with Other Disorders

We must not cease from exploration and the end of all our exploring will be to arrive where we began and to know the place for the first time.

- T. S. Eliot -

There appear to be specific “subtypes” of Attention Deficit/Hyperactivity Disorder that are defined by the co-occurrence or comorbidity with other disorders. These comorbid “subtypes” are not the same as the subtypes defined in the DSM-IV under AD/HD (see Appendix A). The apparent variety of subtypes contributes to the heterogeneity of the disorder, making it difficult to approach as a single entity. As educators we are accustomed to differentiating instruction to meet the individual needs of students based on learning styles. Therefore, information about subtypes is essential for educators if we are to truly understand the disorder and be able to modify our instruction accordingly, as we are already doing to accommodate the diverse styles of all learners. We must move beyond the misconception that AD/HD is a simple, homogeneous disorder; the research indicates that it is otherwise in many cases.
This chapter is a review of the research on the co-occurrence of AD/HD and other disorders, including: Conduct Disorder, Oppositional Defiant Disorder, Learning Disabilities, Bipolar Disorder, Major Depressive Disorder, Anxiety Disorder, and Tourette’s Syndrome. The frequency of co-occurrence of other disorders with AD/HD influenced the selection of comorbidity studies. The frequency of co-occurrence is highest for Conduct Disorder and Oppositional Defiance Disorder, followed by Learning Disabilities, then affective disorders (e.g., Major Depressive Disorder, Bipolar Disorder, Mood Disorder, and Anxiety Disorder), and Tourette’s Syndrome with the lowest frequency of comorbidity (Barkley, 1997; Biederman, Newcorn, & Sprich, 1991). Allergies have been found to co-occur with AD/HD and research is reviewed to explore an association between the two conditions.

If there are “subtypes” of the disorder that are defined by comorbidity, then as educators we need to be aware of these differences and the impact this may have on the selection of instructional approaches. Just as with learning style preferences, first we need to be able to identify the various subtypes of AD/HD in order to develop meaningful interventions. In Chapter V, I review research on intervention strategies that should enhance effectiveness in addressing the individual needs of students with AD/HD.

An additional benefit to the correct identification of subtypes is that it may enable us to implement preventive strategies. Research indicates that siblings of individuals with AD/HD are at a greater risk of developing associated disorders.
If, as members of an educational team, we can identify not only the subtype, but also the risk factors for siblings, we may be able to at least ameliorate the symptoms in subsequent students.

When studying comorbidity, it is important to keep in mind that we are not just looking at the random occurrence of two conditions. We must consider if the frequency of their occurrence together is greater than the occurrence of either alone. Jensen, Martin, and Cantwell (1997) use the example of an individual having a broken arm and a broken leg, which we would not necessarily consider to be a new syndrome unless it was the result of a specific set of risk factors, or if we could glean some meaningful treatment information from the co-occurrence of the two broken bones; in which case the two fractures may be classified under the Battered Child Syndrome. "It is this synergism, i.e., the interaction of the two or more conditions that conveys unique information, that should set the standard for determining whether the comorbid pattern should be regarded as a unique syndrome" (p. 1067). It is this "standard" that defines comorbidity in the context that it is used in regard to AD/HD and consequent subtype identification.

In this chapter I provide an overview of the types of disorders that occur along with AD/HD and the frequency of their co-occurrence. The first two studies are reviews of literature on comorbidity of other disorders with AD/HD. The third is a longitudinal study and there are four studies of patterns of comorbidity with specific disorders. The comorbidity of AD/HD
with allergies is the focus of the eighth study. Although allergies are not in the same category as psychiatric disorders, their comorbidity is included as a confounding factor with AD/HD. A school-based study (conducted in a setting familiar to teachers) is also included. These studies were selected to give educators a sense of the complexity of the disorder, which is due in part to comorbidity with other disorders.

Review of the Literature


This study consisted of a review of approximately 60 studies on AD/HD over the past 15 years to see if any patterns of comorbidity emerged and to see if these patterns shed some light on the nature and treatment of subtypes.¹ Such information might also serve as a means of predicting and thus preventing the full blown manifestation of the disorder(s). The authors noted the significance of identifying subtypes based on comorbidity as a precursor to intervention. They further suggested that only through such classifications can we begin to approach subtypes as

¹ Since this review was conducted on literature from over a fifteen year period, the definitions and terms may vary. In order to maintain the integrity of the original studies, the terms in this review are consistent with those sources. Therefore, ADD may be used instead of AD/HD and the reader is reminded that the defining characteristics may vary somewhat depending on the date of the studies.
more homogeneous groups which may respond uniquely to various treatments and have different outcomes. An analogy for the classroom might be using a predominantly visual mode of instruction for all students when auditory instruction might be better suited to some students.

Results

The authors found the greatest amount of literature on comorbidity of AD/HD with Conduct Disorder/aggression (See Appendix E for DSM-IV definition). The following categories of factors were designated by the authors and taken directly from the article.

Demographic Factors:

- Teenagers with AD/HD combined with Conduct Disorder or Oppositional Defiant Disorder (see Appendix F for DSM-IV definition) had the highest incidence of negative driving consequences.
- Hyperactivity was the greatest risk factor for school failure, and comorbidity with Conduct Disorder did not seem to increase this risk. The authors hypothesized that this may be due to the fact that school failure depends on academic progress rather than behavior.
- AD/HD plus Conduct Disorder doubled the risk of suspension and is the primary factor in higher expulsion and drop out rate over hyperactivity alone.
- AD/HD was a predictor of academic difficulties among subjects with the same I.Q.s.

Biological Factors:
• There were higher rates of Attention Deficit Disorder among delinquents compared to nondelinquents.
• Delinquents with ADD had greater verbal skill impairments and cognitive deficits than nondelinquents.

The risk factors identified for delinquency included ADD with neuropsychological deficits, aggressive behavior with early onset, and adversity in the home/family setting.

Family Genetic and Environmental Factors:

• AD/HD appeared to be related to genetic factors, whereas aggression seemed to be more environmentally influenced.
• The development of Antisocial Personality Disorder [only diagnosed in individuals over 18 years of age (APA, 1994)] seemed to be influenced more by a history of adoptive family psychiatric problems and aggression than by the presence of AD/HD.
• It appears that the interaction between genetics and environment (i.e., family dynamics) must be considered as risk factors for AD/HD with Antisocial Personality Disorder.
• Comorbidity of AD/HD with Oppositional Defiant Disorder (ODD) (see Appendix F for APA definition) indicated a more negative outcome than AD/HD alone.

Clinical Course:

• Comorbidity of AD/HD with Conduct Disorder had more severe, negative, and persistent outcomes than AD/HD alone.

AD/HD with Depression or Anxiety Disorders:

• There was a greater prevalence of AD/HD in depressed
• The combination was more likely in younger children.
• Mothers of children with AD/HD and Depressive or Anxiety Disorders reported more symptoms for themselves than mothers of children with just AD/HD.
• Subjects with AD/HD and Anxiety Disorder responded less favorably to methylphenidate (e.g., Ritalin) than other AD/HD subjects, and in some cases the stimulant actually exacerbated the symptoms.
• Better response has been noted with the use of antidepressants than with methylphenidate.

AD/HD with LD:
• Differentiation between the two indicated that although they have a high incidence of co-occurrence they are two distinct disorders.
• LD was characterized by deficits in word finding and linguistic fluency (reading disability).
• AD/HD reflected weaknesses in verbal learning and attention.

In conclusion, the combination of two or more disorders appeared to increase the severity of the symptoms and the likelihood of negative outcomes. Even though there was some contradiction among research findings, the authors were inclined to believe that, particularly in the case of AD/HD with Conduct Disorder, there was a synergistic effect which suggested a distinct subtype. There were implications embedded in this review which apply to the educational setting summarized as follows.
AD/HD and Conduct Disorder

- Lower I.Q.s
- More reading and learning difficulties
- Multimodal treatment indicated (behavioral and pharmacological therapies)

AD/HD and Anxiety Disorder

- Inhibition of attentional processing tasks
- Lower levels of externalizing behaviors
- Unique pharmacological considerations
- Direct instruction of academic skills is most beneficial

Early intervention for children identified with AD/HD may prevent the development of comorbid conditions which may be responsible for later academic and social problems.


This study was a review of the literature on comorbidity with AD/HD. It was conducted to determine what research has been done and what the findings indicated regarding the co-occurrence of other disorders along with AD/HD.
## Summary of Review

<table>
<thead>
<tr>
<th>Comorbid Condition</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Conduct Disorder</td>
<td>- co-occurrence with AD/HD in 30-50% of cases</td>
</tr>
<tr>
<td>2. Oppositional Defiant Disorder</td>
<td>- limited research</td>
</tr>
<tr>
<td></td>
<td>- frequently combined with Conduct Disorder</td>
</tr>
<tr>
<td>3. Mood Disorders</td>
<td>- across studies found 15-75% co-occurrence with AD/HD</td>
</tr>
<tr>
<td></td>
<td>- vulnerability and risks shared within families</td>
</tr>
<tr>
<td></td>
<td>- either disorder alone has implications for negative outcomes, outcomes are greater with comorbidity</td>
</tr>
<tr>
<td>4. Anxiety Disorders</td>
<td>- ~25% co-occurrence with AD/HD</td>
</tr>
<tr>
<td></td>
<td>- higher incidence of AD/HD in offspring of parents with Anxiety Disorder</td>
</tr>
<tr>
<td></td>
<td>- research indicates that although these two disorders co-occur and have a high occurrence within families, they appear to be transmitted independently</td>
</tr>
</tbody>
</table>
5. Learning Disabilities
- 10-92% reported co-occurrence with AD/HD
- difficult to distinguish between the two

6. Other Disorders
Mental Retardation
- AD/HD is 3 to 4 times more prevalent in this population than in the general population
- high incidence of Conduct Disorder

Tourette’s Syndrome
- ~60% of youth with Tourette’s also have AD/HD
- conversely, only a small % of youth with AD/HD have Tourette’s
- debate exists over whether AD/HD and Tourette’s are genetically linked
- stimulant medication for AD/HD is not advisable for youth at risk for Tourette’s Syndrome

The authors suggested the literature delineated patterns of comorbidity which had implications for treatment and intervention that were appropriate for the combined disorders and varied from
Those indicated for individually occurring disorders.

A Longitudinal Study of Comorbidity with AD/HD


For individuals with Attention Deficit/Hyperactivity Disorder, adolescence and young adulthood usually present increased academic, social, and emotional problems. The frequent co-occurrence of AD/HD with other disorders makes it difficult to determine whether the negative outcomes are due to the AD/HD, the other disorder, or the combination. In an attempt to predict outcomes based on specific disorders in combination with AD/HD, Biederman et al. studied two groups of boys between 6 and 17 years of age. One group of subjects was identified with AD/HD; the control group consisted of normal subjects. They conducted the study over a period of four years. The subjects were all evaluated in five areas of functioning (social, family, cognitive, achievement, and school) in addition to psychiatric disorder, making this research of particular interest to teachers and parents. A baseline was established for all subjects for the presence of comorbid disorders in order to determine if these
comorbidities would persist and were not just secondary effects of the AD/HD.

Results

Baseline Comorbidity Predicted Risk

<table>
<thead>
<tr>
<th>Baseline Comorbidity</th>
<th>Predicted Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Conduct Disorder</td>
<td>- Conduct Disorder (to persist)</td>
</tr>
<tr>
<td></td>
<td>- Oppositional Defiant Disorder</td>
</tr>
<tr>
<td></td>
<td>- Bipolar Disorder (Manic-Depressive)</td>
</tr>
<tr>
<td></td>
<td>- Alcohol and drug dependence</td>
</tr>
</tbody>
</table>

| 2. Major Depression  | - Oppositional Defiant Disorder |
|                      | - Major Depression (to persist) |
|                      | - Bipolar Disorder |
|                      | - Agoraphobia (fear of public places) |

| 3. Multiple Anxiety Disorder | - Anxiety disorders |

| 4. AD/HD without any other disorders (compared to non-AD/HD) | - Oppositional defiant disorder |
|                                                             | - Tic disorders |
|                                                             | - Language disorders |

| 5. AD/HD comorbid with any other disorders (compared to pure AD/HD and non-AD/HD controls) | - greater family conflict |
|                                                                                       | - poorer family interactions & cohesiveness |
Poor social outcomes such as delinquency, substance abuse, and antisocial behavior were attributable to the comorbid disorders rather than the AD/HD alone. However, the AD/HD appeared to be responsible for cognitive and academic deficits as evidenced by repeating grades, LD diagnosis, need for academic tutoring, and placement in special classes. The distinction between characteristics associated with AD/HD vs. those of the comorbid disorders explains a great deal of what we see in classrooms with AD/HD students. Such students have academic problems that are exacerbated by behavior problems which are the result of the comorbid disorder(s). If we can recognize the unique characteristics of the specific subtypes, we can adjust our interventions accordingly. Educators must begin looking at students with AD/HD from a multifaceted perspective if we hope to be successful, or, more importantly, if we want our students to experience success in their lives.

AD/HD Comorbidity


The Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV), defines Attention Deficit/Hyperactivity Disorder as three types: Predominantly Inattentive, Predominantly
Impulsive-Hyperactive, and Combined Type (APA, 1994) (see Appendix A). In general the Inattentive Type would be associated with more internalizing behaviors, whereas the Impulsive-Hyperactive Type is more likely to be manifested through more overt, external behaviors. Eiraldi, Power, and Nezu studied comorbidity patterns of AD/HD using the Inattentive and Combined Type categories, as defined by DSM-IV, and a normal control group. Subjects were assigned to categories on the basis of structured interviews and parent and teacher ratings.

Subjects in the AD/HD Combined Type category had I.Q. scores significantly lower than those in the control group. Socioeconomic status was also lower for the AD/HD Combined group compared to the AD/HD Inattentive Type and the control group. As the authors hypothesized, the co-occurrence of disorders with externalizing behaviors was significantly more prevalent among subjects with AD/HD Combined Type than among subjects in the other subtypes. Specifically, Conduct Disorder and Oppositional Defiant Disorder had a much higher incidence in the AD/HD Combined Type group than in the AD/HD Inattentive Type group.

Although externalizing behaviors were less evident in the Inattentive group in school settings, children in this group were reported to have more conduct problems at home than those in the control group. The authors suggested that this may be because their behaviors (e.g., forgetfulness, disorganization) are less tolerable in the home setting, causing conflict with parents. Both AD/HD groups were at equal risk for internalizing disorders such as anxiety or depression.
5. Psychiatric Comorbidity Among Referred Juveniles with

Major Depression: Fact or Artifact? Joseph Biederman,
Journal of American Academy of Child and Adolescent Psychiatry
34 (5), 579-590.

There is a high incidence of juvenile depression and comorbid disorders, which raises questions regarding the nature of the combined disorders. Within a sample group of clinically referred children and adolescents, 40% met the criteria for a diagnosis of Major Depression. Many were also diagnosed with AD/HD, Conduct Disorder, and Anxiety Disorder. The authors found that the onset of these co-occurring disorders, in most cases, predated that of the Major Depression by a number of years indicating that they may be distinct disorders with overlapping symptoms.

The implication of this finding is that it is important to diagnose all co-occurring disorders as the treatment may be different for each. The example given was that of a specialist in AD/HD who may attribute symptoms to the AD/HD, thus missing the dual diagnosis of Major Depression; a clinician specializing in Major Depression may overlook the AD/HD symptoms. The treatment procedures differ for these two disorders; therefore, it is important to recognize both, as well as the interaction between them. Teachers and parents see irritability as one of the predominant characteristics which prompt them to refer depressed children.


Definition of Terms

**Mania**: excitement manifested by mental and physical hyperactivity, disorganization of behavior and elevation of mood (Merriam-Webster, 1987, p. 723).

**Bipolar Disorder**: previously called Manic-Depressive Disorder; characterized by extreme mood swings alternating between mania (euphoria) and depression.

Through a review of the literature over the years, cases of childhood onset of Bipolar Disorder have been cited, yet the report of incidence is extremely low. In more recent years there has been an increase in the number of cases documented. One of the complications involved in establishing the frequency of occurrence of Bipolar Disorder in children is the manner in which it presents itself. In young children the disorder manifests as irritability, aggression, and temper outbursts, which may be misdiagnosed as depression. Euphoria occurs in older children and adults with Bipolar Disorder.

The characteristic behaviors of Bipolar Disorder overlap with
those of AD/HD, including impulsivity, distractibility, emotional lability (mood swings), and hyperactivity. The comorbidity of these two disorders is high, as was hypothesized and then demonstrated in this study. Of the 43 manic subjects included in this study all but one also met the criteria for AD/HD. Bipolar subjects who were also diagnosed AD/HD had significantly more AD/HD characteristics than those that were only diagnosed with AD/HD.

Educators need to be aware of the symptoms of childhood Bipolar Disorder, the frequency of comorbidity with AD/HD, and how the combination presents itself. As the authors state, more research needs to be done to determine what the interaction is between these two disorders and the behavioral manifestations in the home and educational settings.


As the title indicates, the focus of this study was on the interactions between parents and children, some without AD/HD and others with AD/HD comorbid with low and high levels of oppositional defiant behaviors. The children were given tasks to perform, some academic in nature and of varying levels of
interest. Parent-child interactions were observed across tasks. In high interest tasks, there was less need for parental intervention; therefore, less conflict occurred between the parents and children. There was no notable difference in parent-child interaction among the three groups (i.e., without AD/HD, with AD/HD, and AD/HD comorbid with oppositional defiant behaviors) during academic tasks. High interest appears to be a positive factor for student compliance. This lends support to the current thrust in education towards the use of high-interest, real-life activities for all students, especially those with AD/HD.

Results

- Behavior problems were greatest in the AD/HD group with high oppositional defiant behaviors.
- Parent behaviors were observed to be the same across all groups.
- Parents of both AD/HD groups were reported to use more negative and reactive strategies than parents of the control group.
- Fathers of AD/HD subjects with high oppositional defiant behavior had a greater incidence of psychological disturbance than those of non-AD/HD subjects.
- There was a greater divorce/separation rate among parents of AD/HD children with oppositional defiant behaviors.

There were differences in parenting styles used with all AD/HD children compared to non-AD/HD subjects.
Comorbidity of AD/HD with Allergies


Definition of Terms

atopic: a probably hereditary allergy characterized by symptoms (as asthma, hay fever, or hives) produced upon exposure to the exciting antigen without inoculation (Merriam-Webster, 1987, p. 113).

catecholamine: any of various amines (as epinephrine, norepinephrine, and dopamine) that function as hormones or neurotransmitters or both (Merriam-Webster, 1987, p.215).

Over the years there have been reports of the co-occurrence of allergies in individuals with AD/HD, indicating that there may be a relationship between the two conditions. There appears to be some overlap in the neurotransmitters involved in the nervous system (operant in behavior problems) and the immune system (involved with allergies). I have observed a number of students who were diagnosed with AD/HD and allergies, which caused me to wonder if there was some connection between the two or at least an interaction between medications used in the treatment of each.

If there is a relationship between allergies and AD/HD, then a random sample of subjects with allergies should have a higher
percentage of AD/HD diagnoses. This was the hypothesis that Roth et al. examined. Two groups were compared, one comprised of children with allergies and a control group of children without allergies. The procedure for gathering data included the administration of a series of psychomotor tests, parent ratings, and developmental histories.

**Results**

- Younger children had higher hyperactivity ratings in both groups.
- There were no significant differences by gender in identification of AD/HD.
- There were no significant differences in identification of AD/HD due to parental level of education or occupation.
- A significantly higher number of subjects with allergies exhibited characteristics of ADD than controls.
- Children with allergies appeared to have greater difficulty adjusting processing strategies to match changing task demands.

Future research needs to be done regarding individuals with allergies and AD/HD to see if this is indeed a subgroup with specific characteristics and considerations. It would be interesting to know how many teachers have observed the combination of these two disorders or conditions in students in their classrooms.

Unfortunately, I was only able to find one additional study dealing with the co-occurrence of allergies with AD/HD, although the mention of such a relationship is made in other research. The second study was longitudinal and conducted on a large sample of
children drawn from the general population. The researchers did not find an association between allergic disorders and AD/HD behaviors as reported by parents, teachers and the children themselves (McGee, Stanton, & Sears, 1993). The differences in subjects may account for some of the differences in the findings. Roth et al. used children who were clinically referred for allergy disorders and a nonclinical control group; McGee et al. used children from the general population.

A School-based Prevention Program


The parameters of this study are unique in that it was conducted as part of a school-based prevention program for conduct disorders. The majority of other research has been done with clinically referred subjects for purely research purposes. This study included a prevention component based on the identification of risk factors associated with comorbidity and parental characteristics of children presenting disruptive behaviors. One limitation of so many studies has been that, due to the clinical nature of the subjects, the results cannot be generalized to the larger school population. This research was conducted in a school setting making the results more relevant to school personnel.
However, the authors noted that the subjects primarily represented suburban, middle-class, white populations and, therefore, did not address the added risks associated with economic disadvantage.

**Subjects**

- 318 students in grades 1-4 who screened positive for disruptive behavior.

**Results**

- Almost 2/3 of the subjects met the DSM-IV criteria for AD/HD.
- Many had comorbidity with other psychiatric disorders, primarily Oppositional Defiant Disorder (see Appendix F for DSM-IV definition) and Conduct Disorder (see Appendix E for DSM-IV definition).
- Oppositional Defiant Disorder or Conduct Disorder did not occur frequently without AD/HD.
- There was a lower comorbidity with Conduct Disorder in this study than with samples from higher risk populations².
- Since students were screened for disruptive behavior, those with primarily internalizing behaviors (i.e., inattentive subtype of AD/HD) were indirectly excluded.

The authors believe that by identifying patterns of comorbidity, early intervention programs may be implemented to prevent the full-blown manifestation of Conduct Disorder and Oppositional Defiant Disorder in high-risk populations.

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²Risk factors have been defined in previous chapters. Some examples are maternal smoking during pregnancy, family history of AD/HD and other psychiatric disorders, generalized resistance to thyroid hormone, and low birth weight.
Chapter Summary

The nine studies reviewed in this chapter represent a sample of the research being done on comorbidity of other disorders with AD/HD. The first two studies included extensive reviews of the findings in this area. As with all the research being examined on AD/HD, this is just the tip of the iceberg. The more we learn the more we realize how little we know, but only through such a review can we hope to glean some understanding of the disorder(s). The following summary of findings (Table 2) from this chapter should provide a quick reference for educators. It is not intended to serve as a substitute for reading the entire chapter as there is so much more to be gained from reading the results in the context of each study.

It is imperative that educators have a basic understanding of the significant role that comorbidity plays in the expression and dynamics of Attention Deficit/Hyperactivity Disorder as a precursor to intervention. The findings reviewed in this chapter lay the foundation for the selection and development of appropriate intervention strategies. Without an awareness of how various co-occurring disorders interact, teachers are less likely to plan and implement effective techniques for students with AD/HD. Although no one would question the need for additional research on comorbidity, enough information already exists for us to make wiser decisions in our classrooms. In addition, knowledge of risk factors and predictors can be used to enhance our ability to prevent future academic and behavioral problems in our classrooms by providing early intervention.
### TABLE 2
Summary of Results For Comorbidity with AD/HD

<table>
<thead>
<tr>
<th>Study</th>
<th>Findings</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Review of literature on comorbidity over 15 years</td>
<td>comorbidity intensifies severity of outcomes</td>
<td>prevention of comorbid condition through recognition of characteristics and predicted risks</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study</th>
<th>Findings</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Review of literature</td>
<td>identifies patterns of comorbidity</td>
<td>specific interventions based on patterns of comorbidity combinations may respond differently than individual disorders</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study</th>
<th>Findings</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Longitudinal study</td>
<td>established predicted risks for comorbidity</td>
<td>results indicate specific educational outcomes need to approach AD/HD from a new perspective</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study</th>
<th>Findings</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Comparison study of two DSM-IV subtypes of AD/HD w/ control without AD/HD</td>
<td>AD/HD Combined type had lower I.Q. &amp; SES than controls higher incidence of Conduct Disorder and Oppositional Defiance Disorder w/Combined Type</td>
<td>inattentive group has more conflict at home than at school Combined Type more prone to acting out, externalizing behavior at school</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study</th>
<th>Findings</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Comorbidity w/Major Depression</td>
<td>AD/HD + Major Depression may be distinct disorders w/overlapping symptoms Many comorbid for Conduct Disorder, AD/HD, &amp; Anxiety Disorder along with Major Depression</td>
<td>awareness of co-occurrence as well as symptoms of individual disorders as basis for intervention selection irritability is trait causing many referrals of children with depression</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study</th>
<th>Findings</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Comorbidity w/Bipolar Disorder</td>
<td>overlap of symptoms which may cause misdiagnosis</td>
<td>awareness of frequency of comorbidity awareness of symptoms of Bipolar Disorder awareness of possible interactions between</td>
</tr>
</tbody>
</table>
7. Comorbidity w/ Oppositional Defiance Disorder (Focus on parent-child interactions) - Oppositional Defiance Disorder w/AD/HD - emphasizes value of high interest academic tasks for all children and especially those w/AD/HD compounds the disorder

### TABLE 2 (Continued)
Summary of Results For Comorbidity with AD/HD

<table>
<thead>
<tr>
<th>Study</th>
<th>Findings</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Allergies &amp; AD/HD</td>
<td>- higher hyperactivity ratings for all younger children</td>
<td>- awareness of possible co-occurrence of AD/HD with allergies</td>
</tr>
<tr>
<td></td>
<td>- higher incidence of AD/HD in allergy group</td>
<td>- higher than average co-occurrence of AD/HD in this group</td>
</tr>
<tr>
<td>9. School-based prevention program with focus on Conduct Disorder</td>
<td>- 2/3 of disruptive students met AD/HD criteria</td>
<td>- emphasizes importance of early identification and intervention as prevention</td>
</tr>
<tr>
<td></td>
<td>- high comorbidity of Conduct Disorder &amp; Oppositional Defiance Disorder w/AD/HD</td>
<td></td>
</tr>
</tbody>
</table>
REFERENCES


Parents entrust us with their most precious possession, their children. When problems develop that we have been led to believe are beyond our ability to deal with, we either refer them to other professionals or just fail to provide any support, as is often the case with Attention Deficit/Hyperactivity Disorder. AD/HD has typically been defined through a medical model, and therefore, diagnosed by a medical doctor. In fact, teachers have been cautioned against even suggesting to a parent that a child may have AD/HD. As a result, teachers unintentionally broaden the communication gap between themselves and parents of children exhibiting AD/HD characteristics. At a time when parents need our support and guidance the most, we are unable to give it.

It is not our place to diagnose a child with AD/HD, but it is our job to identify specific academic and social difficulties displayed by any of our students. Only through a thorough understanding of the risk factors identified in chapters two and three, under causes and comorbidity, can we prepare ourselves to meet this challenge. There are many interventions that we can put
in place prior to a student being labeled AD/HD by a physician. Some of these preintervention strategies may preclude the necessity of a formal identification. After all, the primary value in a label is the services or interventions that come as a result. Medication is only one possible intervention, and it should not be used as the only treatment. It would behoove educators to move beyond the misconception that a medical diagnosis of AD/HD must come before classroom interventions are implemented. In the event that a student does require a formal diagnosis, educators can maintain the faith and good will of parents by “doing something” to help in the meantime, while at the same time providing advice on how to seek additional professional help.

Education is a caring profession. Armed with the right information, teachers can earn the respect and support they deserve from the parents of all their students. It is essential that teachers know the current diagnostic procedures for AD/HD. They play a crucial role in that diagnosis; they often are the first to identify a problem; they implement interventions; they serve as primary sources of information to medical professionals; they make initial contacts with parents; and they serve as key members of the team designed to meet the special needs of these students. Although they may not be in the position to make an official diagnosis of AD/HD, teachers are a significant source of information to those professionals who do make that diagnosis.
Current Diagnostic Procedures

As previously stated, the criteria for diagnosing AD/HD have been set by the American Psychiatric Association (APA) in the Diagnostic and Statistical Manual of Mental Disorders, which is in its fourth edition (DSM-IV, 1994) (see Appendix A). Presently, the identification of AD/HD is made on the basis of behavioral observations that are compared to the DSM-IV criteria. Data-gathering methods that are typically used include: parent and child interviews, parent and teacher rating scales, family and developmental histories, and a physical exam (Dulcan & Benson, 1997). In order to get a comprehensive picture, it is necessary to do a multifaceted assessment. Each component (outlined below) is significant and contributes to the larger picture.

Interviews

Parent interviews are used to obtain information about the family. This information should include family dynamics and demographic factors, as well as the occurrence of AD/HD or other psychiatric disorders in other family members (Dulcan & Benson, 1997). Parents may also be informative about persistent or troubling behaviors. Their recollections tend to be clearer than those of the AD/HD individuals themselves.

Teachers can provide information on academic performance and attendance. The classroom environment and the instructional style of the teacher may also be influential factors (Dulcan & Benson, 1997).

Rating Scales

Conners Parent and Teacher Rating Scales (probably familiar
to most teachers) are among the most popular and frequently used scales for rating student behavior (Barkley, 1990). Rating scales should be completed by parents and all teachers who are involved with the student. It is important to have observational feedback across settings as AD/HD can be situational, yielding different results from teacher to teacher. AD/HD rating scales typically include items that measure a student’s activity level, attending skills, degree of compliance, anger control, and ability to get along with others.

**Medical Evaluation**

Health care professionals can rule out confounding conditions that may mimic AD/HD. In addition to a physical examination, lab tests may be indicated to determine if the patient has lead intoxication, a thyroid disorder, or a zinc deficiency (Dulcan & Benson, 1997). A neurological assessment may help ascertain whether or not the individual has difficulty performing neurological tasks (Nemethy, 1997).

**Comprehensive History**

By recording prenatal development or complications and developmental milestones, it is often possible to identify risk factors associated with the development of AD/HD (Nemethy, 1997). For example, in Chapter 2 (Causes) specific risk factors are identified including maternal smoking (Milberger, Biederman, Faraone, Chen, & Jones, 1996), low birth weight (Breslau et al., 1996), and heredity (Biederman et al., 1992; Faraone et al., 1995). If a prenatal history reveals one or more of these indicators, then the individual is at higher risk for developing AD/HD.
Although teachers are not usually involved in the development of a comprehensive medical history profile, it is useful to be aware of its significance. It may also shed some light on the behaviors we observe in the classroom.

The studies reviewed in this chapter relate to the diagnosis of AD/HD. The areas covered are diagnostic issues, diagnostic criteria (e.g., DSM-IV), and laboratory measures such as neuroimaging techniques (i.e., MRI, EEG) and lab tasks. This review takes us from where we are now to a look into the future.

Diagnostic Issues

The diagnostic issues addressed in this section deal with the influence of risk factors, the diagnosis of social disability, and the varying perceptions among participants involved in the identification process of students with AD/HD.


As mentioned in the introduction to this chapter, if we can identify risk factors for siblings of students with AD/HD, we may be able to implement preventive interventions. As teachers know so well, if we can intervene before a behavioral cycle is
established, our efforts are more effective than when we try to correct a problem after it has been established. This holds true for behavioral and academic functions alike. In addition to using good practices for all students, we can implement anticipatory and preventive techniques for students at risk for AD/HD. An awareness of intervention strategies is essential to this implementation.

This study focused on the behavioral and academic outcomes that siblings of individuals with AD/HD are at risk for manifesting including comorbid anxiety, conduct and learning disorders, school failure, and indications of impaired intellectual functioning. All of the participants in the study were assessed for AD/HD according to the DSM-III-R criteria at the beginning of the study, after one year, and again after four years. Three groups of subjects were included: children with AD/HD, normal controls, and the biological siblings of both of the other two groups. Family histories were obtained at the first assessment. Intelligence testing and psychiatric, cognitive and AD/HD assessments were conducted at the baseline and at each follow-up session.

Results

• One half of the siblings of AD/HD children had experienced some degree of school failure and 1/4 were diagnosed with AD/HD at the four-year assessment, suggesting that this is a high risk group.

• A greater impairment existed in siblings of AD/HD children who were AD/HD themselves than in control siblings and non-
AD/HD siblings in all domains evaluated.

- The non-AD/HD siblings of AD/HD children and the siblings of controls were more alike than dissimilar.
- Within the high-risk group (siblings of students with AD/HD) there were significant deficits in arithmetic achievement, attention, and reading, in addition to more repeated grades, tutoring and special education services.
- The high-risk group only showed marginal deficits on intelligence tests, suggesting that school difficulties were not due to deficits in ability.
- Social difficulties were exhibited across settings (home and school) for the high-risk group.
- The degree of impairment and comorbidity of the AD/HD siblings reflected that of children with AD/HD who were clinically referred.

These findings provide a strong basis for establishing screening procedures for children in the high-risk group for AD/HD and other related problems. However, many of the target behaviors were not identified until the four-year follow-up, indicating a possible age factor. Within a school setting, awareness of the increased familial risk for AD/HD can serve as justification for developing interventions before problems occur, as well as prior to a clinical diagnosis.

2. Toward a New Psychometric Definition of Social Disability in Children with Attention-Deficit Hyperactivity Disorder. Ross W. Greene, Joseph Biederman,
One area often associated with AD/HD is that of social deficits. Many children with AD/HD have difficulty getting along with others. The majority of the research on AD/HD focuses on cognitive and behavioral aspects. If social dysfunction puts an AD/HD student at even greater risk for poor outcomes, mechanisms need to be developed to identify social deficits. The authors propose the establishment of a process to diagnose social disabilities in children with AD/HD in much the same way that we diagnose learning disabilities. The procedure used in the study involved demonstrating a discrepancy between intelligence quotients derived from selected subtests on the WISC-R and social functioning as measured by the Social Adjustment Inventory for Children and Adolescents (SAICA).

As predicted, there were significantly higher numbers (22%) of children with AD/HD that were also diagnosed as socially disabled, compared to none in the control group of non-AD/HD subjects, when using the diagnostic approach described above. The consequences of such behaviors include peer rejection and poor relations with teachers and parents, which have a negative impact on self-esteem. In the long run socially disabled students characteristically are more aggressive, experience more school failure, and are prone to substance abuse. Through early identification of a student at high risk for social disabilities,
we may be able to avert or at least ameliorate the severe negative outcomes associated with it. This study puts forth a procedure for diagnosing social deficits and suggests that AD/HD plus social disability may be a distinct subtype of the disorder, in which case specific interventions are indicated. In the meantime while more research is being done to clarify this issue, teachers should be sensitive to the ramifications of concomitant social dysfunction in students with AD/HD and cognizant of possible early interventions.


The diagnosis of Attention Deficit/Hyperactivity Disorder is influenced by a number of variables. Through an examination of the steps in the identification of AD/HD one can gain a better understanding of the disorder and the varying perceptions of those involved. In addition there are often environmental factors that may contribute to the manifestation of AD/HD behaviors which make it necessary to study this phenomenon in the environment in which it occurs. These researchers approached the study of the identification process through the use of in-depth interviews of all participants within the setting that it normally occurs.

The findings of this study are enlightening as they reveal the basis of a great deal of the miscommunication and
misunderstanding that often develops among school personnel, parents, and nonschool professionals (i.e., physicians, psychologists) regarding the diagnosis of AD/HD. The authors reported seven major findings from their observations and interviews with people involved in the labeling process of students with AD/HD. The most significant finding was that of the varying perceptions among those closest to the issue of diagnosis and labeling of students with AD/HD.

Results

- Parents perceived teachers and other school personnel as unresponsive to their concerns about their children’s difficulties, which led them to seek outside help (i.e., physician/psychologist).
- In most cases, upon the diagnosis of AD/HD, the physician recommended medication, and the parents were in agreement.
- After the physician’s diagnosis of AD/HD, in over half of the cases the schools provided extra services or accommodations; in the remaining cases the schools initially resisted making accommodations; in one case a court hearing was pending.
- Interviews revealed a lack of belief in AD/HD as a disability category on the part of some school personnel.
- There was an overwhelming belief on the part of all participants in the survey that the diagnosis of AD/HD fell solely in the realm of medicine or psychiatry and must come from a physician (which led to division rather than collaboration).
• There was a pervasive reliance on the medical model to explain AD/HD and the belief that the disability was located entirely within the individual and could only be treated with medication.

• An adversarial relationship developed between parents and school personnel.

• Along with the label came the interventions the parents had asked for in the first place; the label yields power.

• The AD/HD label was a “no fault label” that placed the blame on something internal to the child and relieved the parents and teachers of the guilt of poor parenting or poor teaching.

The authors hope that educators will use these findings as an impetus to adjust their approach to children with AD/HD and consider the variety of environmental variables that come into play. Teachers have many viable alternatives at their disposal if they are willing to recognize them and go beyond the limited thinking of the medical model with medication as the only intervention.

Educators have the ability to reestablish good rapport with parents by valuing their input. We should put the “power” back in understanding and collaboration instead of in the “label”. We do not need a diagnostic label to identify student difficulties and to put meaningful interventions in place. Regardless of the label, teachers need to be in touch with parents and students and focus on helping the child. The better educators understand the youngster the more they can help. Our first and foremost
responsibility is to our students and meeting their needs as only we can in the classroom. This is in fact what our profession dictates that we do.

Diagnostic Criteria

A number of factors may influence prevalence rates of AD/HD, including the current definition and diagnostic criteria being used and how they are interpreted. Over the years, revisions have been made to the Diagnostic and Statistical Manual of Mental Disorders (see Appendix G). In this section studies are reviewed that focus on changes in the diagnostic criteria and the resulting impact on diagnosis of AD/HD.


Diagnosis has a direct impact on prevalence rates. If clinicians are using broad interpretations of the DSM-IV then the prevalence rates will be higher. In the United States individuals with AD/HD and comorbid disorders are included along with those having AD/HD without comorbid disorders (pure AD/HD). As a result, the reported rate of AD/HD is higher in this country than in other countries such as the United Kingdom which only consider pure AD/HD in prevalence rates. In addition, in the United
Kingdom, for a diagnosis of AD/HD an individual must present characteristic behaviors across all settings and without a significant amount of aggressive behavior. If the same criteria were adhered to in the United States, the prevalence rates would no doubt be more in line with those of the United Kingdom.³

**Purpose:** To examine prevalence rates of pure AD/HD in a special education sample versus a clinical sample and to consider differences in prevalence if behaviors occurred across settings.

**Procedure:** Parents and teachers completed the Conners Rating Scales.

**Findings:**

- As hypothesized, the exclusion based on comorbidity reduces prevalence rates for AD/HD.
- Agreement about the occurrence of AD/HD behaviors across settings (teacher and parent) reduces prevalence.
- The behavioral characteristics of subjects vary considerably based on referral source (those in the clinical sample vs. those in the special education sample).

**Implications:**

Narrower, more clearly defined criteria are influential in reducing prevalence rates. Comorbid disorders may be overshadowing the AD/HD diagnosis. If the diagnostic parameters remain broad and inclusive, specific intervention strategies will be more difficult to identify. Maybe the incidence of AD/HD has not increased, but rather the number of individuals with comorbid

³ This study was conducted prior to the publication of DSM-IV which stipulates that the symptoms must be present in at least two settings.
disorders is clouding the issue.


The criteria for AD/HD have been revised with each edition of the *Diagnostic Statistical Manual of Mental Disorders* (DSM) (see Appendices A and E). Since the criteria in the DSM are used as the basis for diagnosis of the disorder, it would seem reasonable to expect changes in prevalence rates with each revision. Wolraich et al. set out to test this hypothesis by having teachers rate the same group of students (8,258 children in grades k-5) using the criteria for DSM-III-R and DSM-IV. The teachers completed questionnaires on all of their students; therefore, the results are based on a non-clinically referred sample of students contrary to so many of the studies of AD/HD which are done with clinically referred subjects. *When a study is conducted in a school setting with teacher involvement, the findings are so much more relevant to what we are experiencing in real classrooms everyday.*

**Results**

- There was a 57% increase with DSM-IV compared with DSM-III-R (possibly due to new subtypes).
• There was a higher percentage of girls in AD/HD Inattentive Subtype than in the other subtypes (authors suspect girls are under diagnosed and under treated because they present fewer externalizing behaviors).

• There was a high incidence of Conduct Disorder/Oppositional Defiant Disorder with AD/HD Hyperactive-Impulsive Subtype (over half).

In conclusion, the new criteria under DSM-IV seems to be conducive to an increase in the identification of AD/HD because it is more sensitive to previously under-diagnosed subtypes.


Along with changes in the nomenclature over the years, a greater understanding of the heterogeneity of Attention Deficit/Hyperactivity Disorder has developed. Researchers are realizing that there are distinct subtypes of the disorder and that an individual with AD/HD may have characteristics of inattention without having hyperactivity. Studies indicate that the cognitive, behavioral, and social manifestations differ between subtypes with inattention and those with hyperactivity. These distinctions are reflected in the definition of AD/HD in the
fourth edition of the DSM (APA, 1994).

The authors of this study refer to the debate over whether the American Psychiatric Association (APA) acted prematurely in changing the criteria under DSM-III-R before there was enough empirical evidence to justify the changes. They set out to compare the diagnostic criteria of DSM-III and DSM-III-R with that of DSM-IV by retrospectively reevaluating subjects (according to DSM-IV) who had been diagnosed under one of the previous editions (see Appendices A and E). The participants in this study included clinically referred children who had been evaluated and diagnosed with AD/HD under DSM-III or DSM-III-R.

Results

Under the new diagnosis according to DSM-IV criteria:

• No significant differences were found in diagnosis between subtypes for gender or chronological age.

• Significantly more subjects diagnosed as Predominantly Inattentive Subtype were also diagnosed with a math disability.

• A significantly higher percentage of subjects with AD/HD Combined Type also exhibited characteristics of an externalizing disorder (more aggression, conduct problems and delinquency were reported by parents and teachers).

The rates of reported incidence may increase under DSM-IV compared to DSM-III and DSM-III-R. DSM-IV (APA, 1994) gives more information on the disorder, recognizes the Inattentive Subtype, and results in an increase in prevalence rates.
Laboratory Measures

The three laboratory techniques reviewed in this section are magnetic resonance imaging (MRI), electroencephalogram (EEG), and continuous performance task (CPT). Structural magnetic resonance imaging (MRI) is used to make anatomical images and functional magnetic resonance imaging (fMRI) is for studying the volume and flow of blood through the brain (Krasuski, Horwitz, & Rumsey, 1996). Both of these techniques provide more information than an x-ray and are less intrusive than other procedures (Krasuski, Horwitz, & Rumsey). In study number seven, MRI was used since the authors were looking for anatomical brain differences. The future for fMRI is promising as a diagnostic tool in researching brain function (Krasuski, Horwitz, & Rumsey).

Through the use of electroencephalograms (EEGs) researchers can study variations in brain wave activity (Tyler & Howard, 1996). The authors of the study included in this section implemented EEG measures in an attempt to differentiate among students with AD/HD, with undifferentiated ADD (UADD) and those without AD/HD or UADD.

A characteristic often associated with AD/HD is difficulty sustaining attention to a task (Barkley, 1997; Douglas, 1980; Routh, 1980). One measure that has been used to evaluate an individual’s ability to maintain attention is Continuous Performance Task (CPT). Corkum and Siegel (1993) reviewed a number of studies on CPT as a diagnostic tool to identify AD/HD. A summary of their article is included in this section.

The use of magnetic resonance imaging (MRI) as a diagnostic tool for disorders such as AD/HD and Dyslexia is in its infancy. Due to the nonintrusive nature of the procedure, MRI may prove to be a promising additional technique in identifying neurological brain differences in individuals with neuropsychiatric disorders. Until recently the use of MRI was limited to research purposes. However, studies such as this one are laying the groundwork for the use of MRI as a diagnostic procedure. There needs to be a great deal more research to establish its credibility as a diagnostic tool, but this study is taking us in that direction. Magnetic resonance imaging may some day be used in conjunction with other measures to diagnose AD/HD.

Semrud-Clikeman et al. assigned subjects to one of three groups based on a diagnostic workup including intelligence tests, achievement tests, family histories, and ratings on the DSM-IV criteria for AD/HD. The three identified groups were Developmental Dyslexia, Attention Deficit/Hyperactivity Disorder—Combined Type (see Appendix A), and a normal control group. They hypothesized that by using previous research findings regarding
brain anomalies they could predict or verify subject membership in the appropriate group.

When using only the results of the MRI the classifications had an accuracy of 60%, and when the I.Q. scores and chronological age were factored, in the accuracy was raised to 87%. No subjects in the clinical groups were misclassified as normal. Based on the results of this study, it appears that MRI may be useful as one component of an AD/HD diagnostic assessment in support of anatomical brain differences in individuals with this disorder. Much research remains to be done to validate these findings before we can even consider moving towards routine MRIs for the identification of AD/HD.

8. **Quantitative EEG Differences in a Nonclinical Sample of Children with ADHD and Undifferentiated ADD.**


Undifferentiated Attention Deficit Disorder (UADD) was a term used in DSM-III-R referring to Attention Deficit Disorder without hyperactivity. At the time there was insufficient evidence to support a category for deficits in attention and cognitive organizational skills (Barkley, 1990). In this context the term UADD is used in reference to AD/HD-Predominantly Inattentive Subtype. This is yet another example of the difficulties in diagnosis presented by a lack of definitive and consistent
In an attempt to more clearly define AD/HD in terms of physiological differences and to establish more definitive diagnostic criteria, electroencephalographic (EEG) procedures were used on nonclinically referred subjects. EEGs provide brain wave recordings. The students were selected from an elementary school district population based on teacher rating scales and assigned to one of three groups: children with AD/HD, children with Undifferentiated ADD (UADD), and a control group of children without any disruptive behavior disorders. Forty subjects were included in the final study.

Handedness, gender, age, and I.Q. were factored into the analysis to determine if these variables influenced the EEG results. No significant differences were noted between the groups for any of these factors.

Results

The EEG readings suggested that--

- Subjects in the AD/HD and UADD groups were more alike than either group was to the control group.
- Both attention deficit groups displayed more mental arousal and difficulty judging stimuli than the control group subjects, which affected their ability to sustain attention.
- There was more cerebral activity in subjects with AD/HD (both subtypes) than in control group subjects.

Future research needs to address whether there are distinguishable EEG differences among the three subtypes.
identified under DSM-IV, and between the subtypes and non-AD/HD subjects. Currently, we do not have enough evidence of specific variations on EEG readings to justify its use for diagnosis of AD/HD. EEG use is indicated if seizure disorder is suspected (Baumgaertel, Copeland, & Wolraich, 1996).


At first glance Continuous Performance Task (CPT) appears to be the answer to the problem of diagnosing AD/HD objectively (in part by removing rater bias). Through the use of a computer monitor and software, an individual’s responses to a series of stimuli can be recorded. In this technique, a set of stimuli, usually numerals or letters, are presented to the subject. The student is told what predetermined stimuli to look for and to record a response. The responses are evaluated in terms of the number of errors of omission (targets missed) and commission (selection of nontarget items). Omissions are thought to indicate inattention and commissions to reflect impulsivity.

The study of attention is not as simplistic as this approach implies. Corkum and Siegel examined a number of pertinent studies that used Continuous Performance Task to determine the merits of CPT in the diagnostic assessment of AD/HD. They began by looking
at the theoretical basis of Continuous Performance Task and whether it actually measured what it was purported to measure.

The reviewers found that in most of the studies reviewed the researchers used CPT to study performance deficits. However, influential variables such as distractions inherent in the test situation, the nature of the task, and performance over time were not considered in any of these studies. The authors therefore concluded that more research is needed to determine the exact nature of AD/HD as demonstrated by task performance analysis before Continuous Performance Task can be considered as a reliable replacement for rating scales. In other words we need to have a better understanding of both the specific deficits at work in AD/HD and how Continuous Performance Task will assess these deficits in an informative way.

Although its popularity among researchers may be premature at this time, the potential for the use of CPT for diagnostic purposes seems to be present. Additional research is needed. Educators need to keep up with subsequent findings along these lines. In addition the authors reemphasize the point that the diagnostic criteria for AD/HD need to be more selective for severity and occurrence across settings, as well as to differentiate for comorbidity. This was also suggested in the comparison study (see Study #4, Chapter 4) of DSM-III-R and DSM-IV.

Chapter Summary

Some of the authors in this chapter show us how the definitions and diagnostic criteria have made the identification
of Attention Deficit/Hyperactivity Disorder a very complicated and difficult task. An awareness of this complexity facilitates understanding of how prevalence rates can vary from one location to another. It is important for us to recognize the characteristic behaviors of children with AD/HD and the risk for negative outcomes to enhance our selection of appropriate interventions. We can leave the official diagnosis to others, but we cannot leave the collaboration with parents and the responsibility of meeting every child’s needs to anyone else, nor would we want to do so.

It would behoove us to keep up with the research findings and changes in future editions of the *Diagnostic Statistical Manual of Mental Disorders* as they impact on our effectiveness as educators. The more knowledgeable we are the better we will be able to communicate with parents. This chapter also lays the foundation for Chapter 5 which is a review of research on intervention strategies.
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Studies on Interventions for Attention Deficit/Hyperactivity Disorder

It is not because things are difficult that we do not dare to attempt them, but they are difficult because we do not dare to do so.

--Seneca--

The treatment of Attention Deficit/Hyperactivity Disorder is a process, not a product. There is more involved in how teachers approach meeting the needs of children with AD/HD than just which interventions are used. The effectiveness of a particular technique will vary according to its appropriateness for a particular student (Baumgaertel, Copeland, & Wolraich, 1996). What might work with one person might not work with another. Therefore, a fundamental understanding of the variety of ways in which the disorder may present itself in an individual is crucial to the successful implementation of strategies (Baumgaertel, Copeland, & Wolraich).

Due to the multifaceted nature of AD/HD, it may be necessary to use multiple treatments (Goldstein & Goldstein, 1990). For example, stimulant medication has been reported to be effective in controlling hyperactivity in many individuals, but long-term academic gains are not unanimously supported by research (Armstrong, 1995; Barkley, 1990; Goldstein, 1997). Research does
not support the misconception that medication is the only effective treatment for AD/HD. There seems to be some agreement (even among strong advocates for the use of medication) that this should not be the only intervention used for individuals with AD/HD (Armstrong, 1995; Barkley, 1990, 1997; Phelan, 1993; *Physicians’ Desk Reference*, 1995). A combination of procedures across settings may be the most logical approach for such a complex disorder. To treat it with simplicity, believing there is a quick fix, does a disservice to all involved. When considering the efficacy of any strategy, it is important to keep in mind that “One size does not fit all” or even most. It is a misconception that one intervention is equally effective for all students with AD/HD.

Current research on a variety of intervention strategies for use with students with AD/HD and relevant traditional research are reviewed here. Nonmedical techniques are addressed, many are school-based and educationally oriented, including behavior modification, cognitive strategies, academic interventions, and training in social skills. The order of presentation of educational interventions follows the basic development of these techniques historically.

In addition, studies are presented on the use of medication in the treatment of AD/HD, as well as some combined therapies using medication in conjunction with another therapy. Although direct treatment with medication is beyond the scope of educators, it plays a crucial part in the management of many students with the disorder. It is useful for teachers to be aware of the
effects of medication and its interaction with other interventions (Phelan, 1993).

**Educational Interventions**

Behavior modification, particularly the use of consequences, is the most commonly practiced classroom intervention for students with AD/HD (Pfiffner & Barkley, 1990). Teachers are familiar with applications of positive reinforcement in the form of praise and tangible rewards (e.g., tokens, stickers) and negative reinforcement, as in ignoring an undesirable behavior, verbally chastising a student, time-out, and response cost (Pfiffner & Barkley, 1990; Rosen, O’Leary, Joyce, Conway, & Pfiffner, 1984). With all of these techniques the teacher is administering some consequence, be it negative or positive, to the student with the intention of modifying disruptive or off-task behavior. Although such approaches may affect the target behaviors, there may not be a corresponding improvement in academic performance (Barkley, 1990, 1997; Zentall, 1989). Additionally, because the intervention is externally controlled by the teacher, it is usually only effective within that specific environment and as long as the teacher is using the procedure (Baumgaertel, Copeland, & Wolraich, 1996; Zentall, 1989).

Cognitive-behavioral therapies were developed in an attempt to transfer the responsibility for control to the student with AD/HD based on the premise that self-control was an area of weakness for individuals with the disorder (Abikoff, 1991; Christie, Hiss, & Lozanoff, 1984; Goldstein, 1990; Zentall, 1989).
Some approaches included in the cognitive-behavioral category are self-reinforcement, self-monitoring, self-management, and self-talk. These strategies and those mentioned under behavior modification are described as they occur in relation to the research articles reviewed.

**Behavior Modification**

Contingency management (or use of consequences) may take the form of a token economy in which the student is rewarded for the desired behavior with a token that can later be exchanged for a reward (positive reinforcement). Another contingency system, response cost, involves the loss of a token (punishment) if the appropriate behavior is not displayed by the subject (Bos & Vaughn, 1998; Lewis & Doorlag, 1995; Pfiffner & Barkley, 1990). Time-out is a condition in which an individual is removed from a reinforcing situation to one that is not reinforcing, such as removing a child from the group to sit in the hall or in a quiet chair until he is ready to rejoin the group (Bos & Vaughn, 1998).

The following is an example of the effective use of time-out with a kindergarten student with AD/HD. The child was having difficulty keeping his hands to himself during circle time. The teacher asked him to sit at his desk which was close to the group. He was allowed to rejoin his classmates after a brief period of time when he was able to control his behavior. The procedure was handled with dignity for the student and resulted in the desired behavior.

Although the use of social praise and ignoring may be
effective with non-AD/HD children, those with AD/HD usually require more powerful contingencies to modify behavior and improve academic performance (Barkley, 1990; DuPaul & Stoner, 1994; Solanto, 1990). A study conducted by Robinson, Newby, and Ganzell (1981) using a token system with a group of hyperactive boys in a third-grade classroom showed positive results. All eighteen participants improved in academic performance. The emphasis of this study was on the accurate completion of reading and vocabulary tasks. However, inappropriate disruptive and hyperactive behaviors were reduced because they were incompatible with the targeted behavior (i.e., academic task completion).

Factors affecting the success or failure of contingency approaches are the specific characteristics of the individual for whom it is being designed. It is essential that the rewards be meaningful to the child in order for it to serve as an incentive to change. That is, what might be a reward for one child may not be a reward for another. For this reason teachers should elicit input from the students regarding a reward menu and frequently change the items included (DuPaul & Stoner, 1994; Goldstein & Goldstein, 1990; Pfiffner & Barkley, 1990).

Some students with AD/HD do not respond well to positive reinforcement (Barkley, 1990). During my years of teaching I have encountered several students who reacted adversely to reward programs. They would actually perform poorly to avoid attention in the form of praise or tangible reinforcements, perhaps because they did not know how to handle it. One particular student would behave inappropriately until he was removed from the class. I
quickly discovered that this child worked best by himself, and he did not like being part of a group. The best reinforcement for him was to be allowed to complete his assignments in a private space. Reinforcers, themselves, may be distracting to children with AD/HD, interfering with their ability to perform the desired behavior (Douglas, 1985).

Rosen et al. (1984) conducted four experiments using various combinations of positive and negative consequences with a class of eight hyperactive boys. They found that negative consequences used prudently (delivered consistently and without delay) enhanced the effectiveness of the positive consequences. Negative consequences consisted of time-out (in the hall), verbal reprimands, and loss of free time. The positive consequences were social praise, hugs and special privileges. Douglas (1985) pointed out that the balance between negative and positive consequences is crucial. Children with AD/HD tend to become overly impulsive and distracted by rewards. This tendency may be tempered by the clear establishment of rules regarding the loss of a reinforcer (e.g., a token in response cost). However, care should be taken to prevent the frustration that might occur if a student loses more than he earns (Douglas, 1985; Rosen et al., 1984).

In general, research supports the efficacy of contingency management (Barkley, 1990). Solanto (1990) compared the effects of positive reinforcement and punishment (response cost) on impulsivity rates of children with and without AD/HD to see if there was a difference in response between the two groups of
subjects. Included in the study were 20 children with AD/HD and 18 normal controls between the ages of 4 1/2 and 11 years. The researcher found that both groups improved equally in performance, under both contingencies (reward and punishment). In other words, there were no differences in performance between groups under either condition.

A combination of reward plus response cost can also be used as an effective means of behavior modification. An example of such an intervention is the use of a marble jar to store marbles that students earn for appropriate behavior and lose for inappropriate behavior. When the jar is full the students receive the promised reward.

In another study, Rapport, Murphy, and Bailey (1982) reported significantly enhanced effects with the use of contingency management (response cost) when compared to the use of stimulant medication (Ritalin) for improving academics and behavior. The authors pointed out that the majority of studies comparing drug therapy to behavior therapy have reported findings in favor of the former. They suggested that contingency-management procedures (as used in this study) may be more powerful than traditional behavior therapy thus accounting for the different results.

The following reviews are of current studies that focused on the efficacy of specific behavioral interventions for use with students with AD/HD.

Based on previous research that supported the efficacy of contingency management for use with students with AD/HD (Rapport, Murphy, & Bailey, 1982; Rosen et al. (1984), this study was designed to examine the effects of response cost and directed rehearsal on academic performance and classroom behavior. The subjects were two boys with AD/HD, ages 6 and 7 years, who were in a self-contained special education class. The response-cost intervention was implemented through the use of the Attention Training System (ATS) (Gordon Systems, Inc., 1987), a battery operated device that provided positive and negative feedback to the subject. The teacher monitored student off-task behavior and used a remote control to signal the child when he was off-task. The Attention Training System included a module, which was placed on the student’s desk, that tallied and displayed the number of points earned. At the appropriate time the child could trade points for various rewards.

The directed-rehearsal procedure consisted of instruction or modeling of the academic activity by the teacher or aide, followed by additional seatwork for the student. This technique was used if the subject failed to earn a designated number of points for on-task behavior during specific phases of the experiment.

Both students showed significant improvement over baselines
in attending and completing classwork under the response-cost (ATS) condition. According to the researchers, the findings were unclear as to whether or not the addition of the directed-rehearsal contingency was an enhancement over the ATS alone.

The teacher and the aide preferred the use of the ATS to the use of tokens due to the ease of monitoring student behavior. They chose to continue using the program after the experiment was completed. The students also expressed an interest in the continued use of this approach.


Because AD/HD behaviors occur across settings (e.g., school and home) successful interventions are most effective when they are coordinated between teachers and parents. In this study response cost was used at home in conjunction with daily notes from educators reporting to parents on their children’s behavior for the day. The authors cited a number of other studies supporting the efficacy of parent-managed contingencies as compared to teacher-managed programs for improving academic performance (Ayllon, Garber, & Pisor, 1975; Budd, Leibowitz, Riner, Mindell, & Goldfarb, 1981; Karraker, 1972).

Typically, a daily report card provides spaces to record the
students’ academic and classroom behavior. For example, attending to task, remaining seated, completing classwork, being prepared for class, as well as a space for homework assignments may be included (DuPaul & Stoner, 1994).

Five children with AD/HD, between the ages of 6 and 9 years, were selected as subjects. The teachers evaluated the students’ classroom behavior each day and the parents administered consequences based on the daily report. The study was designed to assess the effectiveness of school-home notes, both with and without response cost, to increase the students’ on-task behavior and completion of assignments. An initial baseline was established and two interventions were randomly assigned during the treatment phase (one with response cost and one without). Procedures, behaviors, and rewards or contingencies were clearly established by parents, teachers, and students before the experiment began.

Subjects improved in academic performance and classroom behavior with the use of school-home notes, especially when response cost was also implemented. The teachers stated that this form of intervention (school-home notes) was not only beneficial to the students, but it did not require any changes in routine or demands on their time.

One of the greatest complaints of teachers is that there is never enough time to accomplish all that they need to in a day. The approach outlined in this article was not only effective with the five students involved, but it was manageable within the time constraints of the educators. However, as a fellow educator
pointed out to me, one challenging aspect of this approach is ensuring that parents will follow up on their part of the agreement.

Parents should be involved in planning the interventions and should have an understanding of reinforcement procedures prior to implementation to ensure success (DuPaul & Stoner, 1994). An example of the importance of parent training is depicted in the following scenario. As part of a technology grant, all fifth graders in a particular elementary school were given home computers with Internet access to use for homework and research. Many parents, seeing how excited their children were using this technology, began withholding computer privileges as punishment for misbehavior. Although computer usage was a salient reward, using it as a punishment defeated the purpose of the grant.


Definition of Terms

reinforcer: a stimulus (as a reward or the removal of discomfort) that is effective esp. in operant conditioning because it regularly follows a desired response (Merriam-Webster, 1987, p 993).

response cost: removal of reinforcer when the undesired behavior occurs (e.g., token loss) (Bos & Vaughn, 1998).
contingencies: punishment or reward for the occurrence of a specific behavior (Goldenson, 1984).

Carlson, Gaub, and Alexander cited earlier research on how the use of contingencies (punishment or reward) affected the learning and behavior of children with AD/HD. For example, Douglas (1985) found that the use of rewards could have negative effects on the performance of children with this disorder if the students became distracted by the reinforcers (e.g., tokens) or frustrated by failing to earn the reward. Other studies have shown positive results with the use of negative consequences (e.g., response cost) (Kelley & McCain, 1995; Rapport, Murphy, & Bailey, 1982; Solanto, 1990). However, the authors of this study noted that there was inconsistent support in the research regarding children with AD/HD having a positive response to punishment. In some cases performance actually suffered. They felt this inconsistency in the research warranted further study comparing the effects of punishment and reward on children with AD/HD. As a result, they decided to examine the different effects of reward and response cost (punishment) on performance and motivation in children with and without AD/HD.

The participants included in the study were 40 children with AD/HD and 40 control children without AD/HD, ages 8 to 12 years. There were 27 boys and 13 girls in each group. The children were asked to complete an arithmetic task under one of three conditions (response cost, reward, or no contingency). In the reward condition, tokens were given for correctly completed items. In
In the response-cost condition, tokens were given beforehand and taken away for incorrect or incomplete items. No tokens were used in the no-contingency setting.

Across all three conditions, subjects with AD/HD had fewer problems correct and completed fewer problems than control subjects. In other words, the AD/HD subjects had a poorer performance than non-AD/HD subjects regardless of the intervention. A comparison of test scores for just the students with AD/HD, across the three conditions, indicated that response cost resulted in more problems correct than with reward or no contingency.

In an attempt to assess motivation, participants were given a free-choice task to complete. The children were allowed to select either another set of math problems or a set of spelling exercises to do. Subjects were also asked to rate themselves on motivation. The results indicated that:

- Neither response cost nor reward had a negative effect on self-perceptions of performance or motivation.
- Students with AD/HD in the response-cost condition were more motivated during the free-choice task than students with AD/HD in either of the other conditions.

In summary, according to the findings of this study, response cost was more effective than reward in improving the performance and motivation of children with AD/HD.

Of the numerous therapies suggested in the treatment of AD/HD, stimulant medication and behavioral interventions have received the most support and study among researchers (Barkley, 1990; Rapport, 1992). Prior to this study, the authors reported, no study had been conducted that looked at the effectiveness of both psychostimulants (e.g., Ritalin, Dexedrine, Cylert) and behavioral training for girls with AD/HD. Therefore, the focus of this study was to examine the response of female subjects with AD/HD to stimulant medication (i.e., Ritalin) and attentional training techniques. In this experiment, an electronic device, the Attention Training System (ATS) (Gordon Systems, Inc., 1987), was used to record the child’s attention while completing a computer task. Points were awarded for on-task behavior and deducted for off-task behavior. At the end of the session points could be traded for tangible rewards (e.g., stickers, gum). The device was activated by the experimenter who was observing the subject. The ATS was also used in a study conducted by DuPaul, Guevremont, and Barkley (1992) (see review #1 in this chapter).

The subjects in this study were two six-year-old fraternal twin girls who met the criteria for AD/HD and Oppositional Defiant Disorder according to the DSM-III-R (American Psychiatric Association, 1987) (see Appendix G). Both subjects responded
positively to the two treatments. These positive results were similar to those reported for boys treated with stimulant medication and behavioral interventions (Pelham, Walker, Sturges, & Hoza, 1989) suggesting that the effectiveness of the combined treatments may not be affected by gender. It was recommended to the parents that a combined approach be used for optimal results with their daughters. The authors stated that previous trials on stimulant medication alone had not been as effective with these twin girls.

Cognitive-behavioral Therapy

In part, cognitive-behavioral therapies were developed based on the premise that some individuals needed direct instruction on skills (Schumaker & Sheldon, 1985) rather than learning intuitively by observing and imitating the behavior of others (Bandura, 1969). According to Bandura’s theory of social learning, children learn behaviors, as well as values, through exposure to the models around them. An example of copied behavior is an infant waving “bye-bye” as someone leaves. This type of incidental learning is often an area of weakness for children with AD/HD (Barkley, 1997; Meichenbaum, 1977). Instead, the action must be specifically modeled with explicit directions (Copeland & Love, 1995; Meichenbaum, 1977; Schumaker & Sheldon, 1985). By using direct instruction along with the modeling of self-talk, it was hypothesized that individuals with AD/HD would be able to develop the self-control necessary for successful learning that most people develop intuitively (Bandura, 1969; Barkley, 1990;

Vygotsky (1962) proposed a three-stage theory of language acquisition that fostered the development of cognitive-behavioral therapies. The first stage is external speech which is the expression of thoughts in words. Children begin this process by saying words and then sentences in an attempt to control their environment and to communicate. Egocentric speech is the second stage and it consists of speaking aloud to oneself. When engaging in egocentric speech the child does not need an audience and in fact is often oblivious to the response or presence of others.

Whereas external speech is social and interactive, egocentric speech is more like thinking out loud and is functionally the same as the third stage, which is inner speech (Vygotsky, 1962). Egocentric speech “the link between overt and inner speech.... readily assumes a planning function, i.e., turns into thought proper quite naturally and easily” (p. 45). In other words, Vygotsky believed that egocentric speech served in the transition of speech from external to inner. Through the use of external tools or signs the student is able to solve internal problems. A cognitive example of this process is when children use mnemonics or counting on their fingers to solve problems, and then make the transition to counting and problem solving in their heads.

Inner speech represents the merging of thought and language, and brings with it self-regulation. Behavior of a young child is regulated externally through commands from adults and stimuli from the environment. The development of inner speech enables the
child to plan and reflect before acting (Diaz, Neal, & Amaya-Williams, 1990). Diaz et al. contend that self-regulation is a process involving the regulation of attention, memory, concentration, and problem solving through the use of a plan of action that the individual has formulated. This cognitive process is also referred to as executive function (Castellanos, 1997).

Executive dysfunction, that is the inability to self-regulate impulsivity, attention, concentration, memory, and problem-solving strategies, is characteristic of individuals with AD/HD (Castellanos).

If the natural progression of language, as described by Vygotsky, proceeds from external to internal (Goldstein & Goldstein, 1990; Goldstein, 1997) some children with AD/HD may have a deficit due to an inability to transfer, without assistance, from external to internal control through self-talk (Barkley, 1997; Goldstein & Goldstein, 1990; Goldstein, 1997; Meichenbaum, 1977).

A study was conducted by Meichenbaum (1977) of the egocentric speech of 16 four-year-olds in their preschool setting. Half of the children were impulsive, and the other half were considered reflective. The amount of egocentric talk did not differ significantly in amount between the two groups, but the quality varied in essential ways. The impulsive subjects engaged in more self-stimulating private speech (e.g., chanting, animal noises, nonsense words); whereas, the reflective children used self-regulatory speech and adjusted their self-talk to meet the demands of the task at hand. In conclusion, Meichenbaum believed the
results suggested that impulsive children used inner speech with less maturity and regard for the specific nature of the situation than reflective preschoolers. These findings are supported by the work of Kohlberg, Yaeger, and Hjertholm (1968); Piaget (1955); Maccoby, Dowley, Hogan, and Degerman (1965); Meichenbaum and Goodman (1976); and Zentall (1989).

Typically, cognitive-behavioral therapies include strategies that are designed to enhance self-control through self-regulatory processes (Barkley, 1997; DuPaul & Stoner, 1994; Meichenbaum, 1977; Zentall, 1989). Self-regulation includes actions taken by an individual for the purpose of altering one's own behavior and consequently the outcome (Barkley, 1997). Methods of accomplishing this change in outcome usually involve self-directed activities beginning with having the individual observe his or her own behavior (DuPaul & Stoner, 1994; Zentall, 1989). It is essential to recognize the inappropriate behavior before attempting to change it (Copeland & Love, 1995; Meichenbaum, 1977; Zentall, 1989).

Self-monitoring can be used to identify and record maladaptive behaviors when they occur. Usually, an external cue is implemented initially, as in behavior modification, possibly in the form of a signal from the teacher or an electronic device such as a tape player. However, in cognitive-behavioral modification, the external cue is faded out after the subject has internalized the ability to self-monitor (DuPaul & Stoner, 1994; Meichenbaum, 1977; Zentall, 1989). Through the paired use of cuing and modeling the responsibility for changing behavior is transferred
from an external source (e.g., teacher, parent, device) to the internal mechanisms of the student (Christie, Hiss, & Lozanoff, 1984; Meichenbaum, 1977; Zentall, 1989).

Self-monitoring can play a crucial part in this process by helping the individual develop the ability to recognize the inappropriate behavior, as well as the frequency of its occurrence. By identifying the undesired behaviors, the teacher may begin to employ strategies to improve the subject’s repertoire of reactions (Meichenbaum, 1977). Self-talk (verbalization of actions and thought) should be modeled and then rehearsed in order for most individuals with AD/HD to successfully develop mature use of inner speech (Barkley, 1997; Meichenbaum, 1977).

Christie, Hiss, and Lozanoff (1984) conducted a study on the use of self-monitoring procedures, along with teacher cuing, to modify the behavior of a group of hyperactive children. The researchers intentionally selected a regular classroom setting to avoid the difficulty in transferring training procedures from the laboratory setting to the classroom, which has been noted as one of the drawbacks in the use of cognitive-behavioral therapies, (Barkley, 1990, 1997; Christie, Hiss, & Lozanoff, 1984). According to Barkley (1997) “The most useful treatments will be those that are in place in natural settings at the point of performance where the desired behavior is to occur” (p. 338). The results of the study by Christie et al. (1984) support this contention.

The students involved in the experiment were trained to record and classify their off-task and inattentive behavior as
depicted on a previously video-taped recording. After training, the teacher observed and recorded the student’s behavior and signaled the student to do so as well. The findings indicated that this method of self-recording with teacher signaling led to an increase in on-task and appropriate behavior. Another benefit of self-monitoring is that it can actually cause a change in behavior as a result of the process itself (Heins, Lloyd, & Hallahan, 1986; Reid & Harris, 1993). In other words, the undesirable behavior may become modified without the need for further intervention.

The two main focuses of self-monitoring within educational research have been time-on-task (amount of time the student continues working on the task) and cognitive behavior (actual time the student spends solving the problem or completing the task) (Goldstein & Goldstein, 1990; Reid & Harris, 1993). An example of time-on-task might be the amount of time a student remains seated at a desk working on a math worksheet rather than engaging in off-task behaviors such as getting a drink of water, sharpening a pencil, or staring out the window. How well the student completed the math problems on the worksheet is a measure of cognitive behavior. Time-on-task is measured by quantity of time, as compared to cognitive behavior which is measured by quality of task performance.

Some researchers contend that as a result of more time and attention devoted to the task, academic performance will improve (Heins, Lloyd, & Hallahan, 1986; McDougall & Brady, 1998). Whereas, others argue that an increase in awareness of cognitive
behaviors will result in greater time-on-task (Reid & Harris, 1993).

Reid and Harris (1993) conducted a study comparing the differential effects of self-monitoring of attention and self-monitoring of academic performance with a group of twenty-eight students with learning disabilities. The authors suggested that both forms of intervention increased on-task behavior, but self-monitoring for performance yielded greater gains in accuracy and skill maintenance over time. However, the authors noted, “There does not appear to be a ‘best’ method of self-monitoring for all students on all tasks” (p. 29). As previously mentioned, the specific characteristics of the individual influence the effectiveness of the intervention. Although the subjects of this study were identified as learning disabled, due to the high comorbidity of learning disabilities with AD/HD (Biederman, Newcorn, & Sprich, 1991) the findings may have relevance to educators.

The focus of the following two articles was attention-to-task and academic performance.

5. **Initiating and Fading Self-Management Interventions to Increase Math Fluency in General Education Classes.**


Typically, self-management techniques have been studied in special education settings involving only disabled students (Kern,
Dunlap, Childs, & Clark, 1994). Such procedures are used to increase the amount of time students spend on their academic tasks, which is referred to as time-on-task (Christie, Hiss, & Lozanoff, 1984). In contrast, this study took place in a general education classroom, and the subjects were a combination of students with and without disabilities. The purpose of this research was to compare the effectiveness and generalization of skills with two different self-monitoring approaches. One software program focused on time-on-task and the other focused on increased academic performance (in math).

There were five fourth-grade students who participated. Three were full-time regular education students, one was an AD/HD student in the regular classroom receiving only consultant special education services, and one was an LD student who spent most of the day in the general education class with some time in the resource room. The method of implementation was self-directed by each student. The students self-monitored, self-recorded and graphed progress, self-cued (with audio tape), self-assessed, and self-rewarded.

Participants earned tokens based on improvement over their own baseline scores, not through competing with peers. Gradually, the experimenters faded out the self-management system. When audio-cuing equipment was removed, the students were directed to ask themselves if they were on task. When recording forms were phased out, the students recorded directly on their math worksheets. Modifications had to be made for the student with AD/HD because she was not improving quickly enough. Changes were
made in the frequency and statement used for cuing with this student, due to her problems with inattention and distractibility.  

Results

- Percentage of correct math problems increased for all participants during the intervention and was maintained throughout fading for all but the AD/HD student.
- Engaged time increased for all five participants, even during the fading time.
- Engaged time was slightly higher when the students were monitoring academic performance than when they were monitoring attention to task.
- Generalization of math fluency improved for all participants except the one with AD/HD. For her it remained stable.

Although the student with AD/HD improved in math fluency and engaged time, her gains were not maintained during the fading-out phase, nor did the skills generalize. As noted, modifications were made for this student to enhance her rate of improvement. The authors suggested that researchers explore additional adaptations to self-monitoring methods that might be more effective for students with AD/HD, as well as combining its uses with other techniques.4

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4 For additional information on self-management techniques see Appendix H, Self-management Techniques Resource List.

The issue of self-control, or a lack thereof, has been associated with AD/HD (Barkley, 1997).  In the classroom setting, self-control plays an important part in the student’s ability to work with others and to complete assignments independently (Zentall, Hall, & Lee, in press).  The authors of this article referred to several methods that have been used to enhance self-control in children, including self-monitoring.  Because most self-monitoring techniques have limitations in that they typically require adult supervision and feedback for initial implementation, these researchers wanted to examine a method of self-monitoring that overcame these limitations.  The use of a mirror was selected as a means of directing the students’ attention to themselves as a way of improving performance.

Forty-three middle-school students were selected to participate in the study.  There were 16 students in the more active and inattentive group (8 boys and 8 girls).  The comparison group consisted of 27 students (15 boys and 12 girls) characterized as more attentive and less active than the treatment group.  The participants were selected on the basis of teacher nominations.  Teachers completed rating scales for all students included in the study.

The children were asked to complete a partially-solvable word
search under two different conditions. In one situation there was a mirror mounted on the wall directly in front of the student. The other condition was identical to the first, but there was a blank wall, instead of a mirror, in front of the student. The experimenters examined student performance on the task under the two different conditions for both groups of subjects.

It was hypothesized that through the use of a mirror, self-control would increase and performance would improve. Performance improvement was measured by the word-search task. The results showed that students in the high-activity, low-attention group performed better in the mirrored condition, especially if they looked in the mirror (as compared to just being influenced by its presence). Students in the comparison group actually showed a performance loss in the mirrored condition. Zentall et al. (in press) explained the improvement in the target group in terms of increased self-focus and self-control. In other words, the external cue (i.e., the mirror) served as a signal to the student to exercise self-control.


This was a case study. The subject was a thirteen year old boy in the sixth grade who had been diagnosed with AD/HD. He was experiencing behavior problems at home and disruptive behavior and problems with inattention at school. Special services were
provided through the LD department in English, math, and spelling.

The purpose of the study was to evaluate the use of computer-assisted cognitive training for an individual with AD/HD. The intervention consisted of 35 sessions over a three-month period on a computerized system that was developed to improve such cognitive skills as attention, concentration, memory, problem-solving, and reasoning. These cognitive skills are classified under executive function as it is defined in the introduction to the chapter, and the cognitive training involved the development of the subject’s self-regulation of these skills. The software package used was Captain’s Log by Sanford and Browne (1988). Another program cited in this article was THINKable from IBM (Psychological Corporation/Harcourt Brace Jovanovich, 1991).

Results

The student:

- improved in all areas measured on the Conners Parent Rating Scale.
- showed a gradual decrease in impulsive-hyperactive behavior in weekly scores on the abbreviated Conners Parent Rating Scale.
- improved on some subtests, but showed a decline in behavior on others as measured by the Conners Teacher Rating Scale.
- maintained most gains, but at a slightly lower level, at the seven month follow-up evaluation.
- improved in academic grades from Ds and Fs to Bs and Cs.
- improved in time-on-task and was less disruptive in class, according to teacher reports.
- was successfully mainstreamed for most classes.
Kotwal, Burns, and Montgomery pointed out that the positive results of this case study lend support to the value in using computer software for cognitive training for children with AD/HD. Due to the increased access to computers in classrooms, this treatment should be fairly easy to administer.

**Academic Interventions**

Academic interventions consist of modifications in methods of instruction, instructional materials, or the classroom environment (DuPaul & Eckert, 1997). Examples of modifications in instruction might include the teacher’s use of direct instruction, cooperative learning teams (Fowler, 1994), or peer tutoring (Kohler & Strain, 1990). Materials can be enhanced for students with AD/HD through an adjustment in the length of the assignment, the addition of color cues or the element of novelty, and by providing structure to the task (Fowler, 1994).

Modifications to the classroom environment may take the form of the physical placement of a student’s desk near the teacher or the establishment of organizational procedures and structured lessons (Fowler, 1994). An example of a relatively simple intervention is allowing the student with AD/HD to select two seats within the classroom to be used at his discretion throughout the school day. This technique worked effectively with a child who had been unresponsive to medication, several behavioral modification programs, and professional counseling.

Although there are many sources of suggestions for academic modifications for use in the classroom, there is a dearth of
empirical data regarding the effectiveness of such techniques (Burcham, Carlson, & Milich, 1993; Fiore, Becker, & Nero, 1993; Greenwood, Carta, & Hall, 1988). The reader is referred to Appendix K for a list of Guidelines for Educational Interventions (Fowler, 1994; see also Appendix L).

A number of studies on academic interventions, specifically targeting students with AD/HD, have been conducted by Zentall and colleagues (Zentall, 1989, 1993; Zentall, Falkenberg, & Smith, 1985; Zentall & Meyer, 1987) dealing with modifications in instructional techniques and materials, and classroom environment. Studies reviewed also include the work of DuPaul and Henningson (1993), Greenwood, Carta, and Hall (1988), and Kohler and Strain (1990) focusing on peer tutoring.

The studies selected for review in this section are intended to give teachers an indication of the research that is being conducted and some of the findings. The list is not intended to be all inclusive or conclusive, but rather to add to the reader’s ever-growing knowledge base regarding academic interventions for use with students with AD/HD. As I have mentioned previously, the purpose of this book is to enhance mindful decision making on the part of educators so that they can better meet the needs of their students.

The work of Cruickshank (1975), and Strauss and Lehtinen (1947) laid the groundwork for the study of the benefits of structure for students with attentional deficits and hyperactivity. The purpose of Zentall and Leib's study was to evaluate the effect of task structure on the academic performance of students with and without hyperactivity. Hyperactivity was regarded as excessive activity that results in disruptive or off-task behaviors, thus inhibiting the student's ability to attend. The authors stated that an art lesson was selected in order to provide an activity that the hyperactive subjects would be able to perform as well as the nonhyperactive subjects. By selecting such an activity, they believed they could minimize the effects of the differing ability levels among the students. Individuals with AD/HD were seen as more likely to have academic deficits.

The subjects included 15 boys with hyperactivity and 16 boys without hyperactivity between the ages of 9 and 13 years in grades 3 through 6. Eight boys from each type (with and without hyperactivity) were randomly assigned to the group that would first participate in a highly structured task and then in a task with low structure. The remaining subjects were assigned to a second group that began with a low-structure task and proceeded to a highly structured task. Within the high-structure activity, students were directed to copy or reproduce designs of two models using precut paper squares. In the low-structure task students were to create original designs with the same number of paper squares.

There was significantly more activity in the low-structure
condition for all subjects (those with and without hyperactivity). The authors concluded that added structure to a task decreased student activity level. The implication for educators is that by adding structure to a lesson it may be possible to reduce the activity and the associated distracting behaviors of students with hyperactivity.


As emphasis shifted away from the idea that children with AD/HD were oversensitive to stimulation, the thought emerged that students with the disorder were actually seeking to maintain high levels of stimulation (Douglas, 1980). Instead of thriving in a distraction free environment, it was believed that such students would seek out stimulation (Barkley, 1990). Thus, the optimal stimulation theory was developed by psychologists, who stated that the hyperactive student seeks high levels of stimulation and becomes disengaged or easily bored with repetitive tasks (Zentall, Falkenberg & Smith, 1985).

Based on the optimal stimulation theory, it was hypothesized that performance could be enhanced through the use of increased visual stimulation (Zentall, Falkenberg, & Smith, 1985). The researchers conducted this study to determine if the addition of color cues to a writing task would improve copying skills in
adolescents with attention problems. Specifically, color was added to difficult letter parts and randomly to other letters.

It has been suggested that individuals with AD/HD may not have a problem with over or underarousal; instead, they have difficulty adjusting the level of arousal to match the demands of the task (Douglas, 1980). In this study color was used to highlight salient information for successful letter formation in an attempt to help the students adjust their level of attention to meet the task requirements (i.e., handwriting).

As a learning disabilities specialist, I would often mark important parts of letters, words, or numbers to facilitate student learning. In this way, attention was drawn to the essential aspects of the task that my students may not have recognized.

Thirty-two junior and senior high school boys were selected for the study. One half were rated as being highly active with attention problems and poor handwriting. The remaining 16 were normal controls without hyperactivity or attentional deficits, but they did have poor handwriting. As had been predicted, the handwriting performance of the adolescents with attention problems improved with the color-coding technique, but no improvement was noted in the performance of the subjects in the control group. The authors noted that the use of stimulation was effective when used with repetitive copying tasks (i.e., handwriting). The following study addresses the use of attentional cuing for more complex tasks (i.e., spelling) (Zentall, 1989).

The present study was designed as an extension of previous research using color cuing to increase sustained attention and improve the task performance of hyperactive children (Zentall, Falkenberg, & Smith, 1985). Whereas stimulation has been used to enhance attention to salient details, researchers have found that stimulation can also act as a distraction that interferes with task performance if attention is drawn to nonrelevant details (Rosenthal & Allen, 1980; Zentall, Zentall, & Barack, 1978; Zentall, Zentall, & Booth, 1978). In other words, individuals with AD/HD tend to seek stimulation regardless of whether it is associated with essential or nonessential details. The indiscriminate use of color cuing may actually do more harm than good if it serves as a distraction from the learning task. In this context, the use of visual stimuli to draw a student’s attention to a specific task (Zentall, 1989).

The purpose of this study was to define what constituted the effective use of novel stimuli to enhance task performance (i.e., spelling). For the experiment, 20 hyperactive and 26 nonhyperactive boys in grades three through six, were presented with spelling tasks with and without color coding. The order of task presentation was varied between black letters first, then letters with color added, and the reverse order of trials.
The investigators found that the hyperactive boys outperformed the control group when color was added during practice rather than in the beginning when initial learning was taking place. A spelling task was used because it required selective attention as compared to a simpler task such as handwriting. The implication for educators is to use nondistracting stimuli (e.g., black letters) during the introduction of new, difficult skills, and add color during the rote-practice phase of learning with hyperactive children.

11. Peer Tutoring Effects on the Classroom Performance of Children with Attention Deficit/Hyperactivity Disorder.

George J. DuPaul and Patricia North Henningson.


Students with AD/HD benefit from direct instruction, immediate feedback, and individualized instruction (Pfiffner & Barkley, 1990). Teachers, however, have too many students and not enough time to meet the additional demands of students with this disorder (Kohler & Strain, 1990). Peer tutoring can be used to alleviate the pressure on a teacher to personally meet the individual needs of each student (DuPaul & Stoner, 1994; Kohler & Strain, 1990).

Additionally, by using active response procedures, the excess energy of some AD/HD students that might otherwise result in disruptive behavior can be redirected (Zentall & Meyer, 1987). Peer tutors may provide the extra help needed to implement such
procedures (DuPaul & Stoner, 1994). For a review of peer-mediated methods, the reader is referred to The Use of Peer Tutoring Strategies in Classroom Management and Educational Instruction (Greenwood, Carta, & Hall, 1988).

DuPaul and Henningson presented a case study of the effects of a classwide peer-tutoring program on a student with AD/HD. The intervention was designed based on a program developed by Greenwood, Delquadri, and Carta (1988). The subject was a seven-year-old male in second grade who had been diagnosed with AD/HD. He was experiencing academic difficulties, particularly in mathematics. After a baseline was established for the target student, peer tutoring in mathematics was implemented.

Results

- There was an increase in the subject’s on-task behavior with peer tutoring.
- The subject’s math performance improved.
- The subject’s attention to instruction more than doubled in frequency over the baseline.

The authors attributed the effectiveness of peer tutoring to the methods of instruction used. The one-on-one instruction was geared to the ability level and instructional pace of the student with AD/HD, as compared to a traditional, didactic approach more typically used with whole-class instruction. Through the use of peer tutoring, the aforementioned modifications were put in place that were conducive to student learning. The implication is that through changes in method of delivery the needs of all students can be met and peer tutoring can be used to facilitate those
A colleague shared a story with me of a mismatch between instructional methods being used and the individual needs of a boy with AD/HD. A group of middle-school teachers requested the assistance of an educational consultant to help them deal with this student. My friend spent a full day observing the target subject in his various classes. It was apparent that the young man was not only AD/HD, but also rather intelligent, perhaps even gifted. However, he was experiencing academic as well as behavioral problems at school.

At the beginning of each class the student appeared interested and anxious to participate, but he quickly lost interest when his attempts to interact were ignored. In all but one class, the teachers lectured and allowed only limited student involvement. Even the consultant became restless and bored with this method of instruction.

One teacher used an alternative approach in which the students worked in cooperative groups. In this class all of the students thrived and the student with AD/HD was indistinguishable from his classmates.

This entire scenario depicts the need to use good teaching practices to enhance learning for all students, especially those with AD/HD. Even if a teacher feels limited by large class size, there are alternative ways of individualizing instruction and making lessons interactive. Peer tutoring and cooperative teams are two examples.
School-based Interventions


School Psychology Review, 26 (1), 5-27.

Definition of Terms

meta-analysis: an analysis of a number of studies that focus on the same question and use similar variables (Ary, Jacobs, & Razavieh, 1996).


contingency-management intervention: teacher-mediated reinforcement or punishment to establish or reduce target behaviors (DuPaul & Eckert, 1997, p. 8).

academic intervention: an intervention that focuses primarily on manipulating academic instruction or academic materials (DuPaul & Eckert, 1997, p.8).

A meta-analysis was conducted on 63 studies of the effectiveness of interventions. All of the studies:

- were school based
- had AD/HD subjects
- had no subjects on medication
- were conducted between 1971 and 1995
The types of interventions included were:

- academic (e.g., modification of structure, peer tutoring, use of instructional manipulatives)
- contingency-management (e.g., reward, response cost, punishment)
- cognitive-behavioral (e.g., self-talk, cognitive rehearsal, self-instruction, self-reinforcement)

Results

The meta-analysis showed:

- an increase in the number of studies of school-based interventions over the 24 years.
- that most of the studies were of contingency-management and cognitive-behavioral interventions.
- that most of the participants were from public schools and placed in general education classes for at least part of the day.
- that there were significant behavioral effects of school-based interventions, regardless of the techniques used.
- that there was greater improvement in classroom behavior as the result of contingency-management and academic interventions, than due to cognitive-behavioral interventions.
- that there was greater enhancement of academic performance by cognitive-behavioral interventions than by contingency-management or academic interventions.

This may be interpreted by teachers as an indication that the type of intervention selected should be based on the desired change within a school setting. If one is seeking to improve classroom behavior, contingency-management and academic
interventions seem to be more effective than cognitive-behavioral interventions. However, academic performance seems to be influenced more by cognitive-behavioral interventions than by contingency-management and academic interventions.

13. Who Are The Children With Attention Deficit-Hyperactivity Disorder? A School-Based Survey.


Most researchers of AD/HD focus on children that are referred to a clinic; those who study AD/HD in schools usually look at students in special education placements (Barkley, 1990). The authors examined a school-based sample of students who were medically diagnosed with AD/HD. The purpose was to get an accurate description of how children with AD/HD are served within a school setting, with attention paid to special education services provided (types and range), modifications and interventions implemented, and student achievement.

**Findings**

Demographic information:

- The number of students identified with AD/HD increased in grades 1 through 6 and reached a peaked at third grade.
- The distribution of AD/HD by ethnic group was similar to the proportion of each group within the general school-district
MAKING SENSE OF ATTENTION DEFICIT/HYPERACTIVITY DISORDER 1 4 4

population (with the exception of Hispanics). No Hispanics were identified with AD/HD even though they made up 2.4% of the district population.

Disability categories:
• Fifty-seven percent of the students identified with AD/HD were receiving special education services.
• Over half of the AD/HD students receiving special education services were labeled Behaviorally Disordered (BD).
• The next largest category with AD/HD was LD (28.6%).
• Five percent of the students identified with AD/HD also qualified for the Mental Retardation category.
• Students with AD/HD, particularly in the LD or BD categories, were more likely to also qualify for speech and language services (7.8%).
• Only one student with AD/HD was labeled Other Health Impaired (OHI). (When this study was done in 1994, this was a new category for AD/HD).

Placement:
• The majority of students identified with AD/HD were served in regular education classrooms. Additional services were provided on a resource level for students who qualified for special education.
• Only a small percentage (8%) were served totally outside of the regular classroom.

Academic achievement:
• Even though some students with AD/HD experience academic difficulties findings from this study did not support the notion
of AD/HD as a basis for underachievement. The academic performance of students with AD/HD was commensurate with that of students without AD/HD as measured by standardized math and reading tests.

Educational treatment:

• In this study, over 90% of the students identified with AD/HD were on medication.

• In over 50% of the cases where medication was prescribed there was no physician contact with the school.

• Students with AD/HD receiving special education services had more interventions and accommodations than AD/HD students not receiving special education services.

• The majority of AD/HD students were served in general education classrooms.

If the general education classroom is where the majority of AD/HD students spend the majority of their time, then “...a very real need exists to provide general education classroom teachers with both knowledge of ADHD and a repertoire of techniques to deal with the problems students with ADHD may experience in the general classroom environment” (Reid, Maag, Vasa, & Wright, 1994, p. 133).

There also needs to be more communication between teachers and physicians if medication is going to remain a major intervention treatment for AD/HD (Turecki, 1997). Teachers are often asked to monitor medication, but they feel ill-equipped to do so, especially if there is a lack of guidance from the health-care provider.
Social Skills Training

Most children with AD/HD experience difficulty getting along with parents, peers, siblings and teachers (Frederick and Olmi, 1994). Upon entering the school setting the student with AD/HD is faced with a new set of demands to behave and interact appropriately with others (Barkley, 1990). High levels of activity and impulsivity that were tolerable in a less-structured setting may become areas of concern for educators (Frederick & Olmi, 1994).

By first grade, parents of AD/HD children often are confronted with complaints from teachers regarding the child’s inappropriate and immature social behaviors as well as emerging academic difficulties (Barkley, 1990). Thus, the introduction of the classroom environment and all of the problems inherent in homework may exacerbate an already difficult situation. As the AD/HD behaviors begin to spill over into a number of settings, parents and educators may need to work together to develop techniques that are effective across situations (Barkley, 1990; Frederick & Olmi, 1994).

The following study is an evaluation of the effectiveness of a social skills training program involving parents. Although the training was not conducted in the classroom, the transfer of social skills to the educational setting was assessed through teacher ratings.

14. Parent-Assisted Transfer of Children’s Social Skills

Training: Effects on Children With and Without Attention—

Peer rejection has been seen by researchers as part of the clinical profile of many individuals with AD/HD (Frankel, Myatt, Cantwell, & Feinberg, 1997). Theoretically, by improving social skills, peer rejection would decrease. Although interventions typically do not generalize across settings (e.g., home and school) for children with AD/HD, especially those comorbid with Oppositional Defiant Disorder (ODD) (see Appendix F for APA definition), it was hypothesized that by involving parents as a component of the social skills training program there would be generalization of those skills by the children from school to home.

The treatment group was comprised of 35 children with AD/HD, 14 children without AD/HD, and 19 children with Oppositional Defiant Disorder (ODD). Two subjects with ODD were in the non-AD/HD group. Twenty-four children (1/2 with AD/HD and 1/2 without AD/HD) were in a control group that received no treatment. Within the control group, five were diagnosed with Oppositional Defiant Disorder (ODD). All subjects with AD/HD were on medication. The treatment consisted of twelve sessions of social skills training for the children and concurrent sessions for parents.

The AD/HD subjects who received social skills training showed comparable gains in social skills to those without AD/HD,
according to both parent and teacher ratings. Likewise, subjects with Oppositional Defiant Disorder (ODD) who received social skills training had gains comparable to those without Oppositional Defiant Disorder. Children in the treatment group had outcomes better than the majority (83%) of the subjects not receiving treatment. The improvement in social skills was measured by parent and teacher rating scales.⁵

Medical Interventions

Since 1937, stimulant medication (i.e., Ritalin, Dexedrine, and Cylert) has been the primary treatment for AD/HD (Swanson, Cantwell, Lerner, McBurnett, & Hanna, 1991; Zametkin & Rapoport, 1987). It has been well established in the research that psychostimulants have a positive effect on behavior, but the evidence is not yet available for long-term academic gains (Arnold et al., 1997; Nemethy, 1997; Swanson et al., 1991).

Statistics on stimulant medication indicate that its use for the treatment of ADHD has doubled every four to seven years since 1971. Twenty-five percent of the students in special education programs are on stimulant medication. There has been an increase in medical treatment for girls, students on the secondary level, and children with inattention without hyperactivity (Wilens & Biederman, 1992).

The issue of dosing effect is an important consideration in the use of medication for AD/HD. At higher doses of stimulant

⁵For more information on social skills training refer to Appendix I, Social Skills Resource List.
medication hyperactivity decreases and social behaviors improve, but cognitive performance declines (Goldstein, 1997; Nemethy, 1997; Wilens & Biederman, 1992). It is therefore recommended that lower doses over briefer periods of time may be more effective than increased dosages (Shaywitz et al., 1982; Turecki, 1997). This is contrary to the belief that "...if some is good more must be better" (Turecki, 1997).

Although studies (Barkley, 1990, 1997; Goldstein & Goldstein, 1990; Turecki, 1997; Wilens & Biederman, 1992) show that approximately 70% of children with AD/HD respond to stimulant medication, there is a sizable minority that does not. The reason for this lack of response in some children remains elusive. Comorbidity may be a factor. Poorer responses to stimulant medication have been noted in AD/HD children who suffer from anxiety or depression (Wilens & Biederman, 1992). There are other drugs that may be prescribed for individuals who do not respond to the stimulants. A survey of their efficacy in the treatment of AD/HD and potential side effects goes beyond the scope of this book (see Appendix J, Medications Used in the Treatment of AD/HD). For more comprehensive coverage of medical interventions refer to Attention, Please by Edna D. Copeland and Valerie L. Love (1995).

A great deal of research has been conducted over the years on the use of stimulant medication for the treatment of AD/HD (Turecki, 1997). Two studies were selected for review. Gillberg et al. (1997) dealt with a long-term treatment using stimulant medication. Elia et al. (1993) compares two psychostimulant medications. These studies were selected because they deal with
the efficacy of stimulant medication either in terms of length of time or type of medication.

15. Long-term Stimulant Treatment of Children With Attention-Deficit Hyperactivity Disorder Symptoms.


Definition of Term

placebo: a neutral substance given to subjects in an experiment to make them believe they are receiving a treatment (Ary, Jacobs, & Razavieh, 1996, p. 572).

For sixty years, stimulant medication has been used to control hyperactivity, inattention, and distractibility in children (Zametkin & Rapoport, 1987). According to Gillberg and colleagues (1997) most researchers have focused on short-term effects of stimulant medication. Gillberg et al. wanted to examine the long-term effect of pharmacological interventions on behavior and cognition. The treatment consisted of the use of stimulant medication vs. a placebo for children with symptoms of AD/HD over a fifteen-month period.

Sixty-two children with AD/HD were included in the study. There were fifty-two boys and ten girls between the ages of 6 and 11 years. All subjects had to have an IQ above 50. Participants
were given the WISC-R as an assessment of general intelligence. The Conners Teacher Rating Scale and the Conners Parent Rating Scale were completed on each child in the study. All assessments were completed periodically throughout the experiment.

Results

- The medication-treatment group showed gains on the WISC-R and a reduction in AD/HD behaviors, over the placebo group.
- The medication-treatment group had a slower and later dropout rate (from the study) than the placebo group.

According to the findings of this study, long-term treatment with stimulant medication yielded positive effects in both cognitive and behavioral domains.

16. Classroom Academic Performance: Improvement with both Methylphenidate and Dextroamphetamine in ADHD Boys.


Definition of Terms

double-blind experiment: an experimental technique in which neither the observers nor the subjects know who is receiving the experimental treatment (Ary, Jacobs, & Razavieh, 1996).

placebo: a neutral substance given to subjects in an experiment to make them believe they are receiving a treatment (Ary, Jacobs, & Razavieh, 1996, p. 572).

dextroamphetamine: (d-amphetamine) a stimulant medication

Academic difficulties and school failure are associated with AD/HD (Barkley, 1990; Goldstein & Goldstein, 1990). There is evidence of short-term improvement in academic performance with the use of stimulant medication (Armstrong, 1995). However, according to Elia et al. (1993) the majority of studies on the effects of stimulant medication on academic achievement used methylphenidate (Ritalin). The authors wanted to examine the efficacy of methylphenidate compared to dextroamphetamine (Dexedrine) for the development of math and reading skills.

A double-blind experiment was designed. Neither the observers nor the subjects knew who was taking dextroamphetamine (Dexedrine), methylphenidate (Ritalin), or a placebo. Thirty-three male students (ages 6-12) at a day hospital school participated in an eleven-week study. The first two weeks were used to establish a baseline on each participant before medicine was administered. The boys were assessed on math and reading skills.

Findings

• Students on either stimulant medication attempted more math and reading tasks than students taking the placebo.
• Students on either medication got a greater percentage correct on reading tasks than students in the placebo group.
• The students on dextroamphetamine (Dexedrine) improved in the percentage correct on math tasks.
• Similar side effects occurred in subjects taking either drug including decreased appetite, difficulty sleeping, meticulous behavior, and increased feelings of sadness.

In conclusion, these results indicate short-term improvement in academic performance with the two stimulant medications when compared to the placebo.

Chapter Summary

The complexity of AD/HD is reflected in the research on interventions. Regardless of the type of strategy examined, the success was dependent, at least in part, on the specific circumstances. Even with stimulant medication, the oldest and most used treatment for the disorder, other factors had to be considered. While the short-term efficacy of psychostimulants to control behavior are supported by research, other techniques have proven more effective in the enhancement of academic skills (Rapport, Murphy, & Bailey, 1982).

Although all of the school-based interventions studied had positive results, specific outcomes depended upon strategy selection. This was apparent in the improved classroom behavior with the use of contingency management vs. improved academic performance when cognitive-behavioral approaches were implemented (see Review #12). In study #6, students with AD/HD improved in a word-search task if a mirror was present, but students without AD/HD actually had a decline in skills in the mirrored condition. This illustrates the necessity to be aware of the factors that
impact upon an intervention’s effectiveness under specific conditions.

There is no one intervention that will be the answer to all of the challenges presented by AD/HD. It is crucial that teachers remain focused on the child and not the disorder. Through capitalizing on a student’s strengths and recognizing specific weaknesses, modifications can be designed and implemented to meet individual needs.

Recently, I had the occasion to visit a second grade classroom. The teacher shared her frustrations with me regarding a student she identified as having many AD/HD characteristics. The boy’s parents refused to have him tested by school personnel or evaluated by a physician for a medical diagnosis. The prevailing belief in this particular school was that medication was the only solution to this child’s difficulties. The challenging behaviors that I observed were inattention, lack of organization, and failure to complete assignments. The student did not display any disruptive behaviors while I was present.

When the teacher consulted the principal, she was told that the only thing she could do was to let the child fail second grade, then the parents would realize they had to put him on medication. What a frightening thought when educators feel compelled to punish a child out of a sense of limited options.

There were a number of strategies that the teacher could have used with this student that did not require a medical diagnosis of AD/HD. By helping the child succeed, the school could have built a better relationship with the parents, not to mention the impact
of success on the child. This approach would have been better than trying to force the parents to have their child put on medication. Because there is a sizable minority (25-30%) (Barkley, 1990, 1997; Goldstein & Goldstein, 1990; Turecki, 1997; Wilens & Biederman, 1992) of individuals who do not respond to stimulant medication. Teachers are responsible for meeting their educational needs as well.

The interventions reviewed in this chapter are not intended to be exhaustive. Rather, teachers should view this information as a basis for developing meaningful approaches to use in their classrooms. Table 3 is a summary of the findings and implications of the studies included in this chapter. It is provided to give educators a feel for the limitless possibilities waiting to be developed to meet the unique challenges presented by individuals with AD/HD.

There are more possibilities in nature, in the elements, in man and out of man; and they come as fast as man sees and knows how to use these forces, in nature and in himself.

Possibilities and miracles mean the same thing.

--Prentice Mulford--
## TABLE 3

Summary of Results on Studies on Interventions

<table>
<thead>
<tr>
<th>Type of Intervention</th>
<th>Findings</th>
<th>Educational Implications</th>
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</thead>
<tbody>
<tr>
<td><strong>EDUCATIONAL INTERVENTIONS</strong></td>
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<tr>
<td>Behavior Modification</td>
<td></td>
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</tr>
<tr>
<td>1. Response cost (w/Attention Training System)</td>
<td>Improvement in attending and completing classwork</td>
<td>Findings support use of response cost and ATS for AD/HD in the classroom</td>
</tr>
<tr>
<td>Subjects: 2 males w/AD/HD</td>
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<tr>
<td>2. School-home notes and response cost</td>
<td>Improved academic performance and classroom behavior w/school-home notes, especially in conjunction with response cost</td>
<td>Effective intervention w/relative ease of administration and Parental involvement is a crucial factor</td>
</tr>
<tr>
<td>Subjects: 5 students w/AD/HD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Reward and response cost</td>
<td>More positive results for AD/HD subjects w/ response cost than reward, on performance and motivation</td>
<td>Findings support the use of response cost over reward, in the classroom, for students w/AD/HD</td>
</tr>
<tr>
<td>Subjects: 40 children with and 40 without AD/HD</td>
<td></td>
<td></td>
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<tr>
<td>4. Methylphenidate and attentional training</td>
<td>Subjects responded to the combination of two therapies after an unsuccessful trial of medication alone</td>
<td>Educators can enhance the effects of medication through the implementation of other interventions</td>
</tr>
<tr>
<td>Subjects: a set of twin girls</td>
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<tr>
<td>Cognitive-behavioral Therapy</td>
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<td></td>
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<tr>
<td>5. Self-management (w/computer)</td>
<td>Improved academic performance (short term) Increased time-on-task Generalization for all but AD/HD student</td>
<td>Findings indicate need for additional modifications and interventions for AD/HD students</td>
</tr>
<tr>
<td>Subjects: 5 fourth-grade students, 1 w/AD/HD</td>
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<tr>
<td>6. Attentional focus (through the use of a mirror)</td>
<td>Performance improved on a word-search task under mirrored condition</td>
<td>Findings suggest students with AD/HD may have improved self-control by</td>
</tr>
<tr>
<td>Type of Intervention</td>
<td>Findings</td>
<td>Educational Implications</td>
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<tr>
<td><strong>Academic Interventions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Computer-assisted cognitive training</td>
<td>Improved behavior, grades, time-on-task</td>
<td>Findings support value of Captain’s Log in classroom for students with AD/HD.</td>
</tr>
<tr>
<td>Subjects: 43 middle-school students</td>
<td></td>
<td>Redirecting focus to self (e.g., w/mirrors).</td>
</tr>
<tr>
<td><strong>Structured tasks</strong></td>
<td>Highly structured tasks resulted in lower levels of activity for both groups of subjects</td>
<td>Educators may be able to reduce activity levels and associated distracting behaviors of students with hyperactivity.</td>
</tr>
<tr>
<td>Subjects: 15 boys with and 16 boys without hyperactivity</td>
<td></td>
<td>Increased task structure.</td>
</tr>
<tr>
<td>9. Color stimulation</td>
<td>Improved copying skills with the use of color coding for subjects with AD/HD</td>
<td>Teachers may enhance repetitive task (e.g., handwriting) performance for AD/HD students through the use of color-coding techniques.</td>
</tr>
<tr>
<td>Subjects: 16 high-school boys with and 16 without AD/HD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Attentional cuing</td>
<td>Hyperactive boys out-performed controls when color coding was used during practice of a spelling task</td>
<td>Findings suggest educators use nondistracting stimuli during introduction of difficult skills and color cuing during rote practice for hyperactive students.</td>
</tr>
<tr>
<td>Subjects: 20 boys with and 26 without hyperactivity</td>
<td>Color coding may be distracting to AD/HD students if it is used during initial learning of complex skills</td>
<td></td>
</tr>
<tr>
<td>11. Peer tutoring</td>
<td>Increased on-task behavior, Improved math performance, Increased attention to instruction</td>
<td>Findings suggest peer tutoring may be an effective classroom strategy for meeting the special needs of students with AD/HD.</td>
</tr>
<tr>
<td>* A case study</td>
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</table>
### TABLE 3 (Continued)

Summary of Results on Studies on Interventions

<table>
<thead>
<tr>
<th>Type of Intervention</th>
<th>Findings</th>
<th>Educational Implications</th>
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<tbody>
<tr>
<td><strong>School-based Interventions</strong></td>
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<tr>
<td>12. A meta-analysis</td>
<td>- Significant behavioral effects with all school-based interventions&lt;br&gt;- Improved classroom behavior with academic procedures and cognitive-behavioral contingency management interventions&lt;br&gt;- Improved academic performance with cognitive-behavioral interventions</td>
<td>- To improve classroom behavior, use school-based contingency-management interventions and academic strategies&lt;br&gt;- To improve academic performance use cognitive-behavioral interventions&lt;br&gt;- Intervention selection is situation or student specific</td>
</tr>
<tr>
<td><strong>School-based Interventions (Continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. A survey</td>
<td>- 90% of students w/AD/HD were on medication&lt;br&gt;- The majority of AD/HD students were served in regular education classrooms&lt;br&gt;- AD/HD students served in the regular classroom had fewer interventions and modifications</td>
<td>- Based on this survey, it seems that more interventions for AD/HD students are needed in regular education classrooms</td>
</tr>
<tr>
<td><strong>Social Skills Training</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Parent-assisted social skills training</td>
<td>- All subjects who received treatment had outcomes better than 83% of those not receiving treatment</td>
<td>- The findings supported the use of parent training and assistance as a component of a social skills program for students w/AD/HD, to enhance generalization to the classroom</td>
</tr>
<tr>
<td>Subjects: treatment group</td>
<td></td>
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</tr>
</tbody>
</table>
| of 35 subjects w/AD/HD, 14 without AD/HD, and a control group of 24 subjects 1/2 with and 1/2 without AD/HD                                                                                                           |                                                                                            |}

**MEDICAL INTERVENTIONS**

15. Long-term stimulant medication treatment  - Subjects in the treatment group  - Findings support the efficacy of long-term stimulant medication treatment
Subjects: 52 boys w/AD/HD
and 10 girls w/AD/HD

16. Methylphenidate & dextroamphetamine

- Both stimulants
  - Educators should see academic improvements with students treated with either of these medications
- Enhanced reading performance
- The number of math problems attempted increased on both medications
- Math performance improved with dextroamphetamine

Note. Chart numbers correspond with article review numbers
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Tying It All Together

Knowledge has three degrees--opinion, science, illumination.

- Plotinus -

Based upon a review of the literature and current research, three predominant themes emerge concerning working with individuals with AD/HD: the need to provide classroom teachers with the skills and knowledge to select appropriate interventions, the need for factual information to dispel misconceptions, and the need for collaboration among all those concerned with the education of the AD/HD child. The first theme, which is the purpose of this book and has been addressed throughout, is to empower teachers by providing them with knowledge about AD/HD so that they can select and implement appropriate strategies to enhance the learning of students with AD/HD. This type of decision making can only happen when there is an understanding of the disorder in all its complexity. Through increased knowledge, greater collaboration, and enhanced ability to select appropriate
interventions we can increase the likelihood that students with AD/HD will experience greater success in school.

**MISCONCEPTIONS**

A review of the research was conducted in an attempt to develop a knowledge base to enhance meaningful decision making. Five commonly held misconceptions on AD/HD have been identified that are refuted by the research. The misconceptions coincide with specific chapters.

**MISCONCEPTION #1:** AD/HD behaviors are caused by poor parenting, a lack of discipline, and junk-food diets (Barkley, 1997; National Institutes of Health, 1994; Phelan, 1993).

**RESEARCH INDICATES:** Although no one knows for sure what causes AD/HD, research tends to support a neurological basis for the disorder. Suspected causal factors include genetics and exposure to toxins during crucial stages of brain development. Sociocultural factors, such as diet and family dynamics, have been seen as influential in the manifestation of AD/HD, but not as causes of the disorder. (See Chapter 2, Causes; see also Barkley, 1997; Biederman & Faraone, 1996; National Institutes of Health, 1994).
MISCONCEPTION #2: AD/HD is a simple, singular disorder (Armstrong, 1995; Barkley, 1997).

RESEARCH INDICATES: An entire chapter is devoted to comorbidity because it is a crucial factor impacting on the understanding of AD/HD. Most experts concur on the heterogeneity of the disorder and research indicates that many individuals with AD/HD have one or more other disorders. The frequency of comorbidity with AD/HD is highest with Conduct Disorder and Oppositional Defiance Disorder, followed by Learning Disabilities, and then mood and anxiety disorders (Biederman, Newcorn, & Sprich, 1991). (See Chapter 3, Comorbidity; also see Barkley, 1997; Castellanos, 1997; Goldstein, 1997; Hallowell & Ratey, 1994a).

MISCONCEPTION #3: A medical diagnosis of AD/HD must come before classroom interventions are implemented (Damico & Augustine, 1995; Silver, 1992).

RESEARCH INDICATES: Through increased knowledge and enhanced understanding educators can be empowered to identify behaviors that are characteristic of AD/HD and to implement appropriate
interventions. It is not necessary for a child to be tagged with a label for appropriate modifications to be made in the classroom. In addition, a collaborative team should work together to identify and meet the needs of AD/HD students. (See Chapter 4, Diagnosis; also see Damico & Augustine, 1995; Fowler, 1994; Phelan, 1993)

MISCONCEPTION #4: Medication is the preferred and only effective treatment used for children with AD/HD (Armstrong, 1995).

RESEARCH INDICATES: Teachers can successfully approach AD/HD from an educational perspective, not a medical one. Recently, I heard a teacher say that she could not do anything until the child was put on medication—that had to be the first step. As a result of that kind of thinking many children lose valuable instructional time waiting for help. Many nonmedical strategies can be utilized by educators to meet children’s needs as they emerge.

For the 25-30% of children who do not improve on medication, it is imperative that alternative approaches be used. It is also important to recognize the fact that a response to a stimulant drug is not a confirmation of an AD/HD diagnosis. Many people, even those without AD/HD, improve in focusing and attending as a
result of such medications (Damico & Augustine, 1995; Nemethy, 1997; National Institutes of Health, 1994). Children may be misdiagnosed with AD/HD if medicine is used as the first course of action, thus delaying a proper diagnosis (Nemethy, 1997).

Medication should not be used as an isolated treatment in most cases (Armstrong, 1995; Barkley, 1997; Physicians’ Desk Reference, 1995). Although there are some contradictions, the majority of research findings have demonstrated the short-term benefits of stimulant medication for reducing hyperactivity, impulsivity and aggression, but not for long-term or cognitive gains (see Chapter 5, Interventions; also see Armstrong, 1995; Barkley, 1997; Goldstein, 1997; Swanson, Cantwell, Lerner, McBurnett, & Hanna, 1991). Some children who do not respond to medication alone show improvement when it is combined with other techniques.

**MISCONCEPTION #5:** When it comes to interventions for students with AD/HD, one intervention is equally effective for all students with AD/HD (Phelan, 1993).

**RESEARCH INDICATES:** Research demonstrates the complexity of AD/HD and the need to evaluate each student individually. Teachers must
develop a fundamental understanding of the disorder to effectively select and implement interventions. Due to the uniqueness of each individual with AD/HD, no one technique is appropriate or effective for all. Most teachers, at least initially, want to know what they can do to meet the needs of their students with AD/HD. They expect a list of generic suggestions that can be indiscriminately applied. There are publications that provide such information. However, giving classroom strategies to teachers without first providing them with a basic understanding of the disorder is like putting a Band-Aid on an infected wound. It covers it up temporarily, but does not treat the underlying and pervasive problem. (See Chapter 2, Causes; Chapter 3, Comorbidity; Chapter 4, Diagnosis; Chapter 5, Interventions).

**COLLABORATION**

Attention Deficit/Hyperactivity Disorder is described throughout this book as a disorder that occurs across settings. An individual with AD/HD does not have the option of being afflicted in one place and not in another. There are times when the situation contributes to the expression of the disorder. For example, if a child is extremely interested in a television show he may sit and watch quietly for a long period of time. The same
child may fidget endlessly while doing a tedious homework assignment. However, by definition the symptoms must be present in two or more settings, such as school or work and home (see Appendix A). With that in mind, in order to help individuals with AD/HD, a coordinated effort to make appropriate accommodations across all environments should be pursued.

Many educators may be familiar with the term collaboration as it applies within a school setting among teachers. I am suggesting a much broader definition that would include all persons who have an impact on the life of the student with AD/HD. Parents, teachers, counselors, and health-care providers need to work together toward the common goal of helping the individual with the disorder be successful (Churton, Cranston-Gingras, & Blair, 1998). The child with AD/HD should be paramount in that group, not only as a focus, but also as an active participant.

Successful collaboration is dependent on the establishment of a collaborative ethic (Churton et al., 1998). When applied to AD/HD this refers to the belief that all parties should be involved in meeting the needs of the child with the disability. If teachers believe medication is the first and only answer, they will not be able to convince parents that they can meet the educational needs of the student. If parents feel alienated from
the schools, they will seek professional help elsewhere.

Positive, open-minded, and honest communication among all parties is essential for collaboration to work.

The Venn diagram in Figure 1 is a visual conceptualization of the collaborative interaction needed among team members. The student is the central focus and at the heart of the process. The arrows depict the on-going, interactive communication between and among the parties. Each person represented in the diagram is crucial to the success of the student with AD/HD, both individually and collectively as part of a team.
The Role of the Teacher

The teacher plays an important part in the development and success of the collaborative effort. This category could also include other school personnel that are involved with the student with AD/HD such as the principal, guidance counselor, and school psychologist. There are four ways in which the role of the educator can have a significant impact.

First and foremost, school personnel play a key part in
establishing a positive rapport with parents. A teacher’s ability to speak knowledgeably about AD/HD demonstrates to parents that the educator cares enough to be informed. The establishment of this perception is essential for open dialogue to begin and helps prevent the development of an adversarial attitude. This is the first step towards the creation of a collaborative ethic. It may also be necessary for the teacher to educate the parents on AD/HD as this may be their first encounter with the disorder (Snyder, 1997). Lending support during a difficult time when parents must come to terms with the fact that their child has a disability is an invaluable service.

The second way teachers can be helpful in developing collaborative relationships is by being knowledgeable about educational interventions that can be used effectively for AD/HD. All team members should brainstorm possible strategies to be implemented in the appropriate settings. The educator should be familiar with accommodations for use in school and specifically in the classroom. The parent may wish to pursue a medical evaluation at this time, in which case the teacher, as a member of the team, should be able to provide support and guidance in that regard.

Thirdly, the teacher can develop and implement specific modifications and techniques based on the unique characteristics
of each AD/HD student. The interventions ideally should be custom fit according to the student’s AD/HD profile. In order to be successful in the selection of appropriate procedures, teachers should be knowledgeable about variables that have an impact on the particular student’s academic and behavioral functioning. This would include such factors as comorbidity (co-occurrence) of AD/HD with other disorders and the diagnosed subtype (see Appendix A for DSM-IV definitions of AD/HD subtypes).

The fourth component of the teacher’s role, which would be common to all team members, is the on-going communication and monitoring of the effectiveness of accommodations. The collaborative process needs to be continuous with evaluations and adjustments being made as necessary. There is no known “cure” for AD/HD, but there are accommodations that can be made to enrich the life of the individual with AD/HD and improve that individual’s chances of experiencing success in school. To some extent, accommodations probably will be necessary throughout the school career of students with this disorder. The collaborative team is an ideal vehicle for providing this service, even if there is a change in membership over time.

The Role of the Parent

Oftentimes, parents feel as if the school is not responsive
to their requests for assistance with the difficulties they are experiencing with a child with AD/HD. School personnel frequently perceive parents as uncooperative and difficult to deal with. To meet the needs of the student, both constituents need to get beyond the misperceptions and recognize each other’s value. Parents have a significant role to play in the education of their children. They can be more effective in supporting the efforts of the school if they feel as if they are a part of the collaborative team.

Research shows that there is greater generalization of social skills across settings when parents are involved in the intervention (Frankel, Myatt, Cantwell, & Feinberg, 1997). In addition, coordinated programs between home and school can be quite effective (Barkley, 1990). Through tapping into the valuable resources available within a collaborative team the chances of success on the part of a student with AD/HD are increased tremendously. Educators need to remember the vested interest that parents have in their children and view them as an asset.

The Role of the Student

It is essential that the individual with AD/HD be involved in and informed about most, if not all, aspects of the treatment.
There are three aspects to the student’s involvement. The first is awareness of the problem. Along with a label should come an explanation (Hallowell & Ratey, 1994b). Even a child as young as six years old is capable of comprehending a description if it is given in easily understandable terms. Making the person an active member of the team enhances the possibility of cooperation. Typically, educators, parents, and physicians administer a treatment to a child, making him the object or recipient of the procedure rather than a willing participant.

As the research has shown, individuals with AD/HD usually have difficulty with internal control. By involving the student in the process of intervention selection and through the use of self-management strategies, the focus can be redirected to one of internal rather than external control.

The student should know what to expect. This is particularly true with medication. The physician can get valuable feedback that can be used to make decisions regarding adjustments in dosage. Also, with understanding comes compliance (Turecki, 1997). Sometimes children will resist taking medication or spit it out when they think no one is looking. If they understand why they are taking the medication and how it may affect them, they become a part of the solution rather than a part of the problem.
Along with ownership of the disorder may come a sense of responsibility for one’s actions (Barkley, 1997). Although it may not be within the individual’s ability to completely control behavior, there are strategies that can be implemented by the student to ameliorate the effects. Empower the individual with AD/HD to take control of the disorder (Armstrong, 1995). Giving the child a means of dealing with the disability is far superior to doing it for the individual. Educators have the responsibility of providing students with whatever skills they need to be successful in life. For individuals with AD/HD this means helping them develop the ability to be as self-reliant as possible in implementing strategies to meet their own needs.

The Role of Other Professionals

Included in this category are such nonschool professionals as physicians, clinical counselors, and psychologists. Frequent communication and active participation on the collaborative team are significant functions of each of these members. It is especially important for the physician to monitor medication through other parties, if the student is receiving such treatment. Counselors and psychologists can be an excellent source of
feedback for treatment. Further discussion of these roles is beyond the scope of this book.

Chapter Summary

Together we can make a difference. Approaching the challenges presented by students with AD/HD from a collaborative perspective increases the impact of our efforts tremendously. As the study done by Damico and Augustine (1995) illustrated, misperceptions and ineffective communication can create barriers between school personnel and parents of students with AD/HD. Educators are in the position to establish positive working relationships with families, other professionals, and individuals with the disorder that will aid all involved in meeting the challenges presented by AD/HD.

Final Note

Once when my son was two years old his baby sister was crying endlessly. I asked what we should do to help her and he replied, “Just love her, Mommy.” Sometimes that is all we can do, but it means everything. My son’s words have echoed in my mind many times since that day, and they have served me well as a guide with all of the children that have blessed my life. One of the most
powerful interventions a teacher can have is a caring attitude. A genuine interest can be the driving force behind becoming knowledgeable and collaborating with others to make the world a better place for individuals with AD/HD.
REFERENCES


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Phelan, T. (1993). All about Attention Deficit Disorder. Glen...
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Appendix A

Definition of AD/HD

AD/HD is defined as:

A. Either (1) or (2):
   (1) Six (or more) of the following symptoms of inattention have persisted for at least six 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 in 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 behavior or failure to understand instructions)
   (e) often has difficulty organizing tasks or 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
   (h) is often easily distracted by extraneous stimuli
   (i) is often forgetful in daily activities

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

   Hyperactivity
(a) often fidgets with hands or feet or squirms in seat
(b) often leaves seat in classroom or in other situations in which remaining seated is expected
(c) often runs about or climbs excessively in situations in which it is inappropriate
    (in 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
(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 symptoms that caused impairment were present before age seven 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 Personality Disorder).

Code based on type:

314.01 Attention-Deficit/Hyperactivity Disorder,

Combined Type: if both Criteria A1 and A2 are met for the past 6 months

314.00 Attention-Deficit/Hyperactivity Disorder,
**Predominantly Inattentive Type:** if Criterion A1 is met but Criterion A2 is not met for the past 6 months

**314.01 Attention-Deficit/Hyperactivity Disorder,**

**Predominantly Hyperactive-Impulsive Type:** if Criterion A2 is met but Criterion A1 is not met for the past 6 months

---

Appendix B

Evaluation Criteria For Article Selection

Definition of Headings
I. Reputation of Journal: (X) = a journal that referees submissions prior to approval for publication.
II. Date of Publication
III. Relevance of the Study to Educators:
   (C) = enhances teacher’s communication with others
   (T) = has direct application to teaching
   (D) = facilitates decision making
   (U) = contributes to a basic understanding of AD/HD
IV. Representative of a Body of Literature: (X) = research is cited in the article that supports and reflects the general findings of the literature. The number represents items in the reference list.

Definition of Terms
Experimental: A study in which the subjects are randomly assigned to categories and involving one or more manipulated variables.
Quasi-experimental: A study in which at least one variable is manipulated but subjects are not randomly assigned to groups.
Nonexperimental: A study in which there is no manipulation of variables and no randomization of assignment of subjects.


<table>
<thead>
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<td>Chapter 2: Causes of AD/HD</td>
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<td>1. Evidence of Familial Association Between Attention Deficit Disorder and Major Affective Disorders (Nonexperimental)</td>
<td>X</td>
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<td>U, C</td>
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<td>4. AD/HD in People with Generalized Resistance to Thyroid Hormone</td>
<td>X</td>
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<td>5. Learning Disorders and the Thyroid</td>
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<td>U</td>
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<td>(Nonexperimental)</td>
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<td>8. Psychiatric Sequelae of Low Birth Weight at 6 Years of Age</td>
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<td>10. Association of Attention-Deficit Disorder and the Dopamine Transporter Gene</td>
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<td>15. Gender Differences in ADHD</td>
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<td>(Meta-Analysis)</td>
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<td>Chapter 3: Comorbidity of AD/HD with Other Disorders</td>
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Chapter 4: Diagnosis of AD/HD


2. Toward a New Psychometric
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<td>5. Comparison of Diagnostic Criteria for AD/HD in a County-wide Sample (Nonexperimental)</td>
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<td>6. Validity of DSM-IV AD/HD Predominantly Inattentive and Combined Types: Relationship to Previous DSM Diagnoses/Subtype Differences (Nonexperimental)</td>
<td>X</td>
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<td>8. Quantitative EEG Differences in a Nonclinical Sample of Children with AD/HD and Undifferentiated ADD (Nonexperimental)</td>
<td>X</td>
<td>1996</td>
<td>U</td>
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<td>9. Is the Continuous Performance Task a Valuable Research Tool for use with Children with AD/HD? (Nonexperimental)</td>
<td>X</td>
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Chapter 5: Interventions for AD/HD


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<td>5. Initiating and Fading Self-management Interventions to Increase Math Fluency in General Education Classes (Nonexperimental)</td>
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<td>6. Attentional Focus of Students with Hyperactivity During a Word-search Task (Quasi-experimental)</td>
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<td>10. Attentional Cuing in Spelling Tasks for Hyperactive and Comparison Regular Classroom Children (Quasi-experimental)</td>
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<td>11. Peer Tutoring Effects on the Classroom Performance of Children with AD/HD (A Case Study)</td>
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<td>12. The Effects of School-based Interventions for AD/HD (A Meta-analysis)</td>
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## Appendix C

### Reader Feedback

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<tr>
<td>A. Elementary Principal (Rke. City Schools)</td>
<td>Chapter 5</td>
</tr>
<tr>
<td></td>
<td>CONTENT EVALUATION</td>
</tr>
<tr>
<td></td>
<td>#1. How important is the subject of AD/HD to you as an educator? Please explain why.</td>
</tr>
<tr>
<td></td>
<td>1. Very important in increasing # of diagnosed students, legal responsibility to address needs.</td>
</tr>
<tr>
<td>B. Middle-school English teacher (Bote. Co.)</td>
<td>1. It is very important to AD/HD students’ learning, to other students who may be distracted by their behaviors, and to me because I want ALL my students to succeed.</td>
</tr>
<tr>
<td>C. High School Special Educator (Rke. City)</td>
<td>1. The subject of AD/HD is very important to me because of the students I teach. Knowledge of this disability is necessary in order to provide these students with the best opportunity to succeed.</td>
</tr>
<tr>
<td>A. Elementary Principal</td>
<td>#2. How important was this specific chapter to you and why?</td>
</tr>
<tr>
<td>B. M.S. Teacher</td>
<td>2. New findings to share with my staff.</td>
</tr>
<tr>
<td></td>
<td>2. This chapter is perhaps the most interesting and useful because it relates directly to what I can do to help youngsters achieve.</td>
</tr>
<tr>
<td>C. H.S. Teacher</td>
<td>2. Chapter 5 is important because of the specific studies conducted. These studies provide valuable information for anyone working with AD/HD students. This chapter provides methods to try on various students.</td>
</tr>
<tr>
<td>A. Elementary Principal</td>
<td>#3. How important or valuable were the specific research studies included in each section? What was most valuable to you and why?</td>
</tr>
<tr>
<td></td>
<td>3. It affirms the value of strong teaching, the level of compassion the teacher has for</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Educator</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. H.S. Teacher</td>
<td>3. The specific research studies were important because of the information on ways to intervene. I found it helpful to know that response cost improved performance and motivation more than rewards.</td>
</tr>
<tr>
<td>A. Elementary Principal</td>
<td>1. Yes.</td>
</tr>
<tr>
<td>B. M.S. Teacher</td>
<td>1. Yes</td>
</tr>
<tr>
<td>C. H.S. Teacher</td>
<td>1. Yes</td>
</tr>
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</tr>
<tr>
<td>A. Elementary Principal</td>
<td>2. Yes.</td>
</tr>
<tr>
<td>B. M.S. Teacher</td>
<td>2. Yes</td>
</tr>
<tr>
<td>C. H.S. Teacher</td>
<td>2. Yes</td>
</tr>
<tr>
<td>#2. Was the language within the text easily understandable? If not, please identify those areas.</td>
<td></td>
</tr>
<tr>
<td>A. Elementary Principal</td>
<td>3. see note--p.100 (personal anecdote)</td>
</tr>
<tr>
<td>B. M.S. Teacher</td>
<td>3. You might clarify your intro and closing. At beg., I failed to realize it was merely a lead-up. The summary at end was read as first as a summary of the preceding study.</td>
</tr>
<tr>
<td>C. H.S. Teacher</td>
<td>3. I found the chapter to be informative and easy to read. The format is good and I especially liked the tables. I don’t think I’d change anything.</td>
</tr>
<tr>
<td>#3. What areas would you keep, delete, modify? Please tell how and why you would make those changes.</td>
<td></td>
</tr>
<tr>
<td>A. Elementary Principal</td>
<td>4. Additional suggestions:</td>
</tr>
<tr>
<td>B. M.S. Teacher</td>
<td>4. Will you be creating a list of interventions that teachers can review quickly &amp; then refer to the study if desired?</td>
</tr>
<tr>
<td>C. H.S. Teacher</td>
<td>4. None</td>
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<tr>
<td>A. Elementary Principal</td>
<td>Chapter 6 CONTENT EVALUATION #1. How important is the subject of AD/HD to you as an educator? Please explain why.</td>
</tr>
<tr>
<td>B. M.S. Teacher</td>
<td>1. see above</td>
</tr>
<tr>
<td>C. H.S. Teacher</td>
<td>1. see above 1. A crucial part of successfully working with AD/HD students is being able to communicate with all parties involved. Becoming more knowledgeable on this subject is necessary in order to do that successfully. The teacher must be perceived as an ally not an adversary.</td>
</tr>
<tr>
<td>A. Elementary Principal</td>
<td>#2. How important was this specific chapter to you and why?</td>
</tr>
<tr>
<td>B. M.S. Teacher</td>
<td>2. A very quick summary--almost too quick.</td>
</tr>
<tr>
<td>C. H.S. Teacher</td>
<td>2. The misconception/fact is effective as a powerful summation and reminder.</td>
</tr>
<tr>
<td></td>
<td>2. The sixth chapter is important because it provides valuable information on how to help AD/HD students. It also dispels myths about medication. All teachers need to know that medication alone is not an answer. Individuality must be considered along with strategies.</td>
</tr>
<tr>
<td>A. Elementary Principal</td>
<td>#3. How important or valuable were the specific research studies included in each section? What was most valuable to you and why?</td>
</tr>
<tr>
<td>B. M.S. Teacher</td>
<td>3. Blank</td>
</tr>
<tr>
<td>C. H.S. Teacher</td>
<td>3. They show that you didn’t make it all up!! I really like the role of the student. All too often he is not part of the team. 3. Chapter 6 provided valuable information on misconceptions. I especially found interesting the fact that interventions weren’t equally effective for all. Also that</td>
</tr>
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</table>

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<thead>
<tr>
<th>Educator</th>
<th>Question</th>
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<td>B. M.S. Teacher</td>
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<td>#2. Was the language within the text easily understandable? If not, please identify those areas.</td>
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<td>A. Elementary Principal</td>
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</tr>
<tr>
<td>B. M.S. Teacher</td>
<td>2. Yes.</td>
</tr>
<tr>
<td>C. H.S. Teacher</td>
<td>2. Yes.</td>
</tr>
<tr>
<td>#3. What areas would you keep, delete, modify? Please tell how and why you would make those changes.</td>
<td></td>
</tr>
<tr>
<td>A. Elementary Principal</td>
<td>3. I love the son/baby sister story! Personally I believe that the student/teacher relationship is the most critical for all students esp. AD/HD because some of their behavior traits seem to make them appear “difficult to love”.</td>
</tr>
<tr>
<td>B. M.S. Teacher</td>
<td>3. No changes.</td>
</tr>
<tr>
<td>C. H.S. Teacher</td>
<td>3. I would not change chapter 6. It is informative and easy to read.</td>
</tr>
<tr>
<td>#4. Additional suggestions:</td>
<td></td>
</tr>
<tr>
<td>A. Elementary Principal</td>
<td>4. I am glad you are synthesizing this information. I hope that you will be offering inservice for RCPS staff.</td>
</tr>
<tr>
<td>B. M.S. Teacher</td>
<td>4. Blank</td>
</tr>
<tr>
<td>C. H.S. Teacher</td>
<td>4. None.</td>
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Appendix D

Feedback from Pediatric Psychiatrist

on

Chapters 1, 2, 3, and 4

NOTES:

- Give sense of stability rather than what is current but not established.
- Obviously a great deal of work went into these chapters.
- Summarize more--not time to read it all. Synopses are most valuable and will be most useful to teachers.
- There are limits to recent research--it is obsolete in a year. Do something enduring.
- Look at Continuous Performance Task which is being widely used by psychologists for diagnosis, but it is not definitive or sensitive enough.
- Look at nonmedication and give some idea about most recent research.
- Look at the effect of sugar on AD/HD behaviors.
Appendix E

Definition of Conduct Disorder

Conduct Disorder is defined as:

- Serious violation of rules and societal norms
- Presence of three or more of the following characteristics in the past 12 months:
  - threatens/causes physical harm to other people or animals
  - destroys property of others including setting fires to cause damage
  - lies, steals
  - breaks rules: truancy, runs away from home, violates curfews

Appendix F

Definition of Oppositional Defiant Disorder

According to DSM-IV, Oppositional Defiant Disorder is defined as:
- Less serious behaviors than exhibited with Conduct Disorder, without aggression towards people and animals
- More defiance towards authority figures
- Four or more of the following characteristics present for the previous six months:
  - frequently loses temper
  - argumentative with adults
  - defies authority
  - deliberately annoying to others
  - projects blame onto others
  - frequently angry, or spiteful
  - easily annoyed by others

If the individual qualifies for the diagnosis of Conduct Disorder and Oppositional Defiant Disorder only the diagnosis of Conduct Disorder is applied.

Appendix G

Synopses of Diagnostic and Statistical Manual of Mental Disorders


DSM-II (APA, 1968) – Hyperkinetic reaction of childhood (or adolescence):

The definition focuses on hyperactivity, impulsivity, restlessness, and short attention span. The disorder is reported as occurring in early childhood and diminishing in adolescence.

DSM-III (APA, 1980) – Attention Deficit Disorder With or Without Hyperactivity:

The diagnostic criteria include the presence of symptoms of inattention, impulsivity, and hyperactivity. Special regard is given to situational differences, with preference given to teacher reports over parent reports. The age of onset is specified as before age 7, with at least six months duration. Conditions not included are Schizophrenia, Affective Disorder, or Severe or Profound Mental Retardation.

DSM-III-R (APA, 1987) – Attention-Deficit Hyperactivity Disorder in Children:

The criteria include 14 items of which at least 8 must be present before 7 years of age. No subtypes are recognized and ADD without hyperactivity is classified as Undifferentiated ADD
(UADD). A diagnosis of Pervasive Developmental Disorder would exclude an individual from the category of ADD.
Appendix H

Self-management Techniques Resource List


THINKable Rehabilitation System [Computer program]. San Antonio, TX: Author. (555 Academic Court, San Antonio, TX 78204)

Appendix I

Social Skills Resource List


### Medications Used in the Treatment of AD/HD

**Appendix J**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage</th>
<th>Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PSYCHOSTIMULANTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methylphenidate (Ritalin)</td>
<td>5 mg, 10 mg, 20 mg</td>
<td>loss of appetite</td>
</tr>
<tr>
<td>(tablet)</td>
<td>(not for children under 6 yrs.</td>
<td>weight loss</td>
</tr>
<tr>
<td>* 3-4 hrs.</td>
<td>of age)</td>
<td>insomnia, tics</td>
</tr>
<tr>
<td>Time to reach peak effect</td>
<td></td>
<td>headaches</td>
</tr>
<tr>
<td>in children - 1.9 hrs.</td>
<td></td>
<td>nervousness</td>
</tr>
<tr>
<td>Sustained release tablet</td>
<td>20 mg</td>
<td>controlled substance</td>
</tr>
<tr>
<td>* 6-8 hrs.</td>
<td>(not for children under 6 yrs.</td>
<td>w/potential for abuse</td>
</tr>
<tr>
<td></td>
<td>of age)</td>
<td></td>
</tr>
<tr>
<td>Dextroamphetamine (Dexedrine)</td>
<td>5 mg</td>
<td>appetite suppression</td>
</tr>
<tr>
<td>(tablet)</td>
<td>(not for children under 3 yrs.</td>
<td>compulsive behaviors</td>
</tr>
<tr>
<td>* 4-6 hrs.</td>
<td>of age)</td>
<td>insomnia</td>
</tr>
<tr>
<td>Sustained release capsule</td>
<td>5 mg, 10 mg, 15 mg</td>
<td>controlled substance</td>
</tr>
<tr>
<td>* 8-12 hrs.</td>
<td>(not for children under 6 yrs.</td>
<td>w/potential for abuse</td>
</tr>
<tr>
<td></td>
<td>of age)</td>
<td></td>
</tr>
<tr>
<td>Dextroamphetamine Sulfate</td>
<td>10 mg, 20 mg</td>
<td>palpitations</td>
</tr>
<tr>
<td>(Adderall)</td>
<td>(not for children under 3 yrs.</td>
<td>elevated blood pressure</td>
</tr>
<tr>
<td></td>
<td>of age)</td>
<td>- insomnia, tics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- euphoria, dizziness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- headaches, nausea</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- weight loss</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- dry mouth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- restlessness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- controlled substance w/potential for abuse</td>
</tr>
<tr>
<td>Pemoline (Cylert) tablet</td>
<td>18.75 mg, 37.5 mg, 75 mg</td>
<td>3 to 4 weeks to work</td>
</tr>
<tr>
<td>* 12-24 hrs.</td>
<td></td>
<td>insomnia, headaches</td>
</tr>
<tr>
<td></td>
<td></td>
<td>temporary weight loss</td>
</tr>
<tr>
<td></td>
<td></td>
<td>drowsiness, dizziness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>irritability, tics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>stomach aches</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rare reports of liver problems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>not a controlled substance, low</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ANTIDEPRESSANTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imipramine</td>
<td>10 mg, 25 mg, 50 mg</td>
<td>ECG changes</td>
</tr>
</tbody>
</table>

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(Tofranil) tablets (not to exceed 2.5 mg - sensitivity to sunlight in children) - may take up to 3 wks. to work

* = Length of Action   ECG = electrocardiogram

**Note.** The data for length of action are from "Medication: Your questions answered," by W. Coleman, 1994, Challenge, 8, p.4.

Appendix K

Guidelines for Educational Interventions

* Place the student with teachers who are positive, upbeat, highly organized problem-solvers.

* Provide the student with a structured and predictable environment.

* Modify the curriculum.

* For excessive activity:
  - Channel activity into acceptable avenues.
  - Use activity as a reward.
  - Use active responses in instruction.

* For inability to wait:
  - Give the child substitute verbal and motor responses to make while waiting.
  - When possible, allow daydreaming and planning while the child waits.
  - Suggest alternative behaviors (e.g., line leader, paper passer).

* For failure to sustain attention to routine tasks and activities:
  - Decrease the length of the task.
- Make tasks interesting.

**For noncompliance and failure to complete tasks:**
- Generally increase the choice and specific interest of tasks for the child.
- Make sure tasks fit within the student’s learning abilities and preferred response style.

**For difficulty at the beginning of tasks:**
- Increase the structure of tasks and highlight important parts.

**For completing assignments on time:**
- Increase the student’s use of lists and assignment organizers (notebooks, folders), write assignments on the board and make sure the student has copied them.
- Establish routines to place and retrieve commonly used objects such as books, assignments, and clothes.
- Teach the student that, upon leaving one place for another, he or she will self-question, “Do I have everything I need?”

Note. From National Information Center for Children and Youth with Disabilities (NICHCY) Briefing Paper by Fowler, 1994, Washington, DC:
National Information Center for Children and Youth with Disabilities. Copyright free information.
Appendix L

Additional Intervention Strategies Resource List


Vita

Carol R. Lensch presently is an assistant professor at Hollins University in Roanoke, Virginia. She received her BA from SUNY with majors in behavioral sciences and education. Her MS is in special education from Radford University. For most of her career she has taught students in elementary school settings. She has been a learning disabilities specialist for 17 years.