Ritalin and AD/HD: A Case Study

An Honors Thesis (HONRS 499)

By

Sarah Pearson

Thesis Advisor
Dr. Jill D’Angelo

Ball State University
Muncie, IN

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Abstract

Attention Deficit/Hyperactivity Disorder is a behavioral disorder that affects a large portion of children in the United States. It is important to understand the ways in which this disorder affects children in order to accurately diagnose and treat those who suffer from it. The methods of diagnosis for AD/HD are questionable, and some of the most common treatments are under-researched. There has been little research conducted concerning the long term effects of stimulant medications on children. I have presented research on the history of AD/HD, typical treatments for the disorder, and the statistics associated with AD/HD. This research is then applied to one particular family that is dealing with AD/HD. The purpose of this thesis is to serve as a learning experience for myself. This work should by no means be considered to be an all-inclusive set of research.

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Attention Deficit/Hyperactivity Disorder affects a large portion of the children in the United States. Current studies indicate that it affects as few as two percent of children and as many as six percent. According to the United States Census Report, in 2002 there were approximately 70.4 million children under the age of 18 in the United States. In other words, anywhere from 1,408,000 to 4,224,000 children are suffering from AD/HD in the United States. While there are significant amounts of research available concerning AD/HD, there are some aspects concerning AD/HD which remain under-researched. This paper will explore some of these under-researched topics as well as the history of AD/HD as a disorder. The research will then be applied to an actual child who is suffering from AD/HD.

Where is the research lacking?

There is little research available on the effect that AD/HD has on delinquency and criminality; however, the research available indicates that AD/HD has a significant effect on delinquency in youth and criminality in adults. People who suffer from AD/HD often exhibit impulsivity and poor self-control. This combination can contribute indirectly to increased delinquency and criminality (Dalteg & Levander 1998 & Levander 1998). A recent study estimated that 25% of the adult inmate population suffered from AD/HD and another 50% of the population showed several of the symptoms of AD/HD (Unnever, Cullen, & Pratt 2003). A 20 year follow-up study of delinquent youth found that those youth who met the criteria for AD/HD had a life time increase in crime of 250% compared to their peers that did not suffer from AD/HD (Dalteg & Levander 1998).
Until recently, there has been little research conducted to determine how methylphenidate works or what the potential long term effects are for methylphenidate. Methylphenidate is a Schedule II drug according to the FDA Controlled Drug Schedules (www.resultsproject.net). Schedule II drugs are considered to be medications that have therapeutic uses and have the highest potential for abuse and dependency compared to other medicinal drugs. Other drugs in this category are Morphine, Demerol, Amphetamines, Methamphetamine, and Cocaine. Research has revealed that methylphenidate works the same way that cocaine does, furthermore, methylphenidate is a more potent stimulant than cocaine (Vastag 2001). When most people experience something pleasurable neurons release dopamine into the brain. The dopamine travels across the synapse to a dopamine receptor which then creates a pleasant sensation. Once the dopamine has reached the receptor and sent the pleasurable signal, autoreceptors, which transport dopamine, gather the excess dopamine left in the synapse and return it to the neuron that sent it.

Cocaine blocks up to 50% of these autoreceptors, so large quantities of dopamine are left in the synapse. The excess dopamine continues to stimulate the dopamine receptors creating a continual sensation of pleasure. Methylphenidate blocks the same autoreceptors that cocaine does, but the average dose of methylphenidate (.5mg/kg) blocks 70% of the autoreceptors. This leaves even more dopamine in the synapse which makes methylphenidate a more powerful stimulant than cocaine (Vastag 2001).

Over-stimulation of the dopamine receptors over an extended period of time causes a reaction in the brain. The brain cannot handle the constant stimulation, so it tries to prevent the stimulation by eliminating the dopamine receptors. In long-term cocaine
users, this eventually leads to a form of psychosis which resembles schizophrenia. If methylphenidate works in the same way as cocaine, it is logical to assume that it will have similar long term side effects.

**Methylphenidate Production**

In recent years there has been a large increase in the production of methylphenidate. There has also been a large increase in the consumption of methylphenidate in the United States.

In 1990 the annual production of methylphenidate was 1,768 kilograms and by the middle of 1995 the production of methylphenidate had increased to 10,410 kilograms (Safer, Zito, & Fine 1996). During this same period in time, outpatient doctor's visits devoted to AD/HD increased from 1.6 million visits in 1990 to 4.2 million visits in 1993 (Greenhill, Halperin, & Abikoff 1999). Approximately ninety percent of the children seen during these doctor's visits were given prescriptions for stimulant medications such as methylphenidate (Greenhill et al. 1999). By 1995, 2.8% of young people in the United States ages 5 to 18 were taking stimulant medication for AD/HD and ADD (Safer et al. 1996).

At the same time, the use of methylphenidate to treat AD/HD also increased in other areas of the world. For example in British Columbia, in 1990 1.9 out of every 1000 children had a prescription for methylphenidate. By 1996 that number had climbed to 11.0 out of every 1000 children (Miller, Lalonde, McGrail, & Armstrong 2001). This rate of increase is actually higher than the rate of increase in the United States. However, the overall prevalence of use in the United States remains higher than in other areas of the world. In the United States it is currently estimated that 2.5-3% of all children are
receiving stimulant medication for AD/HD versus 1.3% of children in British Columbia (Miller et al. 2001).

The United States consumes approximately 90% of the methylphenidate that is produced each year (Senate Hearing, Dr. Block). There has been a 500% increase in Ritalin use in the United States since 1990 (Opening Statement, Senate Hearing). Since 1997, the use of Adderall to treat Attention Deficit/Hyperactivity Disorder has increased 1017% (Lisa Marie Presley, Senate Hearing).

Possible Explanations

The increased production of methylphenidate has many possible explanations. One possible explanation is that stimulant medications are not taking as much negative press as they used to. Parents may feel more comfortable placing their children on medication than they have in the past (Safer et al. 1996). Children who are diagnosed with AD/HD are also tending to stay on the medication for longer periods of time than in the past. In 1975, only 11% of AD/HD youth in their high school years were on medication. By 1995, that number had increased to 31%. In recent years, there has also been a large increase in the number of children between the ages of 2 and 4 who are on stimulant medication for AD/HD (Gilman, Senate Hearing).

Another possible explanation for the increased production rates of methylphenidate may be a result of pressure from drug companies to prescribe stimulant medication. The drug company, Novartis, stands to gain $1236 in stock market value for every one prescription of Ritalin (Senate Hearing). There is also a monetary incentive for parents to place their children on methylphenidate. Those who are receiving public assistance can get up to $175 per month in federal benefits if their child is placed on
methylphenidate.

Whatever the explanation for the increased production of methylphenidate, important to remember that 90% of the methylphenidate produced is consumed within the United States. The increase in production indicates that there is also an increase in consumption which would also indicate an increase in the diagnosis of AD/HD. Since the long term effects of stimulant medications in children are unknown, it is important to ensure that only those children who suffer from AD/HD are receiving treatment for it.

**Is AD/HD Being Over-diagnosed?**

In recent years there has been an on-going debate over whether or not AD/HD is being over-diagnosed. Many members of the psychological community believe that there is enough evidence to support the fact that AD/HD is a real disorder and it is being properly diagnosed and treated in almost all instances. There are other psychologists who believe that AD/HD is not a real disorder, and people have begun to medicate children for behaving like children. There is almost unanimous agreement in the psychological community that the methods of diagnosing and treating AD/HD need to be evaluated.

The methods of diagnosing Attention Deficit/Hyperactivity Disorder are questionable. In most situations, teachers observe the behavior of children in their class rooms. Some children might have a hard time staying on task to complete their assignments. Others could act up in class all the time. Some could simply have a hard time paying attention in class, and some might be restless and fidgety all day. Based on these observations, a teacher can recommend to parents that their child be evaluated by a medical professional for Attention Deficit/Hyperactivity Disorder. Parents are often
given a checklist or a written description of their child’s classroom behavior to take with them to the medical examination (Senate Hearing).

The medical examination is typically conducted by the child’s pediatrician. The doctor will first review the paperwork completed by the child’s school. He will then conduct a short examination of the child and might ask the child a few questions about school and the child’s behavior. The doctor will also ask the parents of the child what they have observed about the child’s behavior while at home. The typical outcome from the examination is a diagnosis of AD/HD and prescription for methylphenidate or another AD/HD medication (Senate Hearing).

The symptoms associated with Attention Deficit/Hyperactivity Disorder are very ambiguous which makes AD/HD very difficult to diagnose. Symptoms such as acting out in the classroom or inability to stay on task or complete assignments are also signs of boredom which may be the result of frustration. The child may have a slight learning disability and may be acting out due to frustration. There is also a very realistic possibility that the child could be gifted and simply does not feel challenged by the work (see Table 1).
Symptoms of Giftedness:
- Poor attention, boredom, daydreaming in specific situations
- Low tolerance for persistence on tasks that seem irrelevant
- Judgement lags behind the development of intellect
- Intensity may lead to power struggles with authorities
- High activity level; may need less sleep
- Questions rules, customs and traditions

Symptoms of AD/HD:
- Poorly sustained attention in almost all situations
- Diminished persistence on tasks without immediate consequences
- Impulsivity, poor delay of gratification
- Impaired adherence to commands to regulate or inhibit behavior in social contexts
- More active, restless than other children
- Difficulty adhering to rules and regulations

Symptoms of childhood depression, which is officially diagnosed as Early-onset Dystymic Disorder, can also easily be mistaken for symptoms of Attention Deficit/Hyperactivity Disorder. Children who are depressed often have a difficult time sustaining concentration on one task for an extended period of time. They also may have a difficult time remaining still when it is expected and might act out because of frustration and inability to cope with their emotions (see Table 2).
Diagnostic Criteria for Dysthymic Disorder:

A. Depressed mood for most of the day, for more days than not, as indicated either by subjective account or observation by others, for at least 2 years. Note: In children and adolescents, mood can be irritable and duration must be at least 1 year.

B. Presence, while depressed, of two (or more) of the following:
   1. poor appetite or overeating
   2. insomnia or hypersomnia
   3. low energy or fatigue
   4. low self-esteem
   5. poor concentration or difficulty making decisions
   6. feelings of hopelessness

C. During the 2-year period (1 year for children or adolescents) of the disturbance, the person has never been without the symptoms in Criteria A and B for more than 2 months at a time.

D. No Major Depressive Episode has been present during the first 2 years of the disturbance (1 year for children and adolescents); i.e., the disturbance is not better accounted for by chronic Major Depressive Disorder, or Major Depressive Disorder, In Partial Remission.

E. There has never been a Manic Episode, a Mixed Episode, or a Hypomanic Episode, and criteria have not been met for Cyclothymic disorder.

F. The disturbance does not occur exclusively during the course of a chronic Psychotic Disorder, such as Schizophrenia or Delusional Disorder.

G. The symptoms are not due to the direct physiological effects of a substance (e.g., hypothyroidism).

H. The symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.

Table 5- This the diagnostic criteria for Dysthymic Disorder as described by the DSM-IV-TR.

Because of the ambiguity of the symptoms associated with Attention Deficit/Hyperactivity disorder, it is important that a trained psychological professional conduct such examinations and formulate the diagnosis (Senate Hearing). This could help reduce the number of overall diagnoses every year as well as decrease the likelihood of a misdiagnosis of AD/HD.
Brief History of AD/HD

It is a commonly held belief that Attention-Deficit/Hyperactivity Disorder (AD/HD) was simply a disease of the late twentieth century and the beginning of the twenty-first century. The fact is AD/HD is not a new disorder; AD/HD is simply the latest diagnostic label for a common psychological disorder (Anastopoulos 2001). Older diagnostic labels for this disorder include Imbecility, Moral Imbecility, Idiocy, Minimal Brain Dysfunction, and Post Encephalitic Disorder (Sandberg & Barton 2002).

The first published case reports of disorders similar to AD/HD began appearing in the mid-1800's (Anastopoulos 2001). These reports often described children and adults suffering from symptoms such as poor school performance, extreme extroversion, outbursts of violent behavior, high levels of distractibility, thievery, sleep disruptions, general forgetfulness, and morality that was inconsistent for the developmental age of the subject (Anastopoulos 2001). Those suffering from these disorders also experienced difficulty organizing tasks and extreme levels of restlessness (Sandberg & Barton 2002). This group of symptoms became known as Idiocy.

Idiocy was defined as a "mental deficiency or extreme stupidity, depending upon malnutrition or disease of the nervous centres, occurring before birth or before evolution of the mental faculties in childhood" (Sandberg & Barton 2002, 99). According to Dr. Charles Mercier, those diagnosed with Idiocy suffered from a severe developmental delay (Sandberg & Barton 2002). Idiots did not achieve a proper level of basic self-preservation; therefore, they were considered to be a danger to themselves and others because they were completely unaware of their surroundings (Sandberg & Barton 2002).
Imbecility was another one of the first AD/HD-like disorders. It was scientifically studied in the late 1800's and into the early 1900's. Imbecility was a term used to identify a person with superior mental capacity to that of an Idiot but still suffered from an inability to function properly in society (Sandberg & Barton 2002). In 1912 the Royal College of Physicians in England developed the official definition of Imbecility. A person suffering from Imbecility was “incapable from birth or from an early age, (a) of competing on equal terms with his normal fellows, or (b) of managing himself or his affairs with ordinary prudence (Sandberg & Barton 2002, 101).” Imbecility was a commonly occurring disorder. People could be suspected of suffering from Imbecility for actions as simple as failing to meet the demands of conventional institutions (Sandberg & Barton 2002).

The concept of Moral Imbecility was defined around the same time as Imbecility. Moral Imbecility was identified as both a medical and a legal concept. The British Mental Deficiency Act of 1913 defined Moral Imbeciles as “persons who from an early age display some permanent mental defect coupled with strong vicious or criminal propensities on which punishment has had little or no deterrent effect (Sandberg & Barton 2002, 103).” Symptoms of Moral Imbecility were similar to those of Imbecility, but also included lawlessness, dishonesty, mischievousness, and destructiveness (Sandberg & Barton 2002). It is possible that these additional symptoms were the result of hyperactivity. Those suffering from Moral Imbecility were considered to be incredibly intelligent because they had the capacity to understand the laws; however, they willfully chose to disregard them (Sandberg & Barton 2002).
At the time that Moral Imbecility was being defined and discussed, it was believed that morality was a phenomenon that developed from organic brain functions (Sandberg & Barton 2002). It was theorized that those suffering from Moral Imbecility were either born with or suffered from some form of damage to their brains which resulted in the development of the disorder.

When Idiocy, Imbecility, and Moral Imbecility were first being researched, it was discovered that the symptoms of these disorders were more prevalent in individuals who had shown some form of brain or neurological damage (Anastopoulos 2001). During the first half of the twentieth century, it became a popular theory that brain damage was the cause of behavioral disorders. This led to the development of the Minimal Brain Damage theory. This theory simply stated that brain damage was the major cause of inattentiveness, distractibility, general sleep disturbances, and underdeveloped morality (Anastopoulos 2001).

Post-encephalitic Behavior Disorder was another disorder in the early 1900s that was similar to what is currently known as AD/HD. The existence of this disorder helped to support the brain damage theory of behavioral disorders. During World War I, there was a large outbreak of encephalitis. Encephalitis during the 1920's was an often fatal illness that consisted of extremely high fevers, sluggishness, and hallucinations (Sandberg & Barton 2002). Children who survived this illness often displayed an impaired attention span, poor impulse control, emotional instability, impaired memory, depression, poor motor control, and hyperactivity (Anastopoulos 2001 and Sandberg & Barton 2002). The high fevers from encephalitis likely resulted in some form of brain damage. It was believed that these symptoms were the result of a physiological
mechanism, so a child was not responsible for his or her actions (Sandberg & Barton 2002).

Not everyone in the field of psychology at the time was satisfied with this explanation of behavior disorders. In the early 1960s the Minimal Brain Damage theory was challenged because there were large numbers of children suffering from behavior disorders that showed no evidence of past brain damage (Anastopoulos 2001). This led to the development of the concept of Minimal Brain Dysfunction. Minimal Brain Dysfunction consists of the same AD/HD-like symptoms as all of the disorders already discussed. By labeling the disorder Minimal Brain Dysfunction, the role of the brain in the disorder is preserved; however, this label gave the brain a less defined role (Anastopoulos 2001). It was still believed that the functions of the brain played an important role in the development of this disorder; however, specific brain damage was no longer thought to be the cause of the disorder.

All of these disorders had similar symptoms; however, the various diagnostic labels made it difficult to study the disorder. Thus, it was difficult to compare the studies (Anastopoulos 2001). Consequently, there was little progress made in determining the exact symptoms and origins of AD/HD during the first half of the twentieth century.

**AD/HD and the DSM**

In the mid-twentieth century, the American Psychiatric Association developed the *Diagnostic and Statistical Manual of Mental Disorders* (the DSM). The DSM organized all of the various behavior disorders with similar symptoms into one category or set of diagnostic criteria. The symptoms of AD/HD were grouped together and placed under the same diagnostic label. This made it possible to conduct research and compare the
results. As a result of this, there has been much progress made in the ability to accurately diagnose and treat AD/HD.

The *DSM-I* was published in 1952. The *DSM-I* did not have any disorder described within it that resembles the diagnostic criteria for AD/HD. At the time there were not proper guidelines for diagnosing children with psychological disorders (Anastopoulos 2001). Freudian psychology was the popular school of thought when the *DSM-I* was being developed. According to Freud, in order to truly suffer from a psychological disorder, it was necessary for an individual to have a superego. The superego does not develop until later in life; therefore, children did not have the psychological capacity to have mental disorders since they lacked the necessary superego (Anastopoulos 2001).

While the *DSM-II* was being developed there was a shift in thought about children and their ability to develop psychological disorders. This shift was reflected in the *DSM-II* when it was released in the 1960's. Members of the psychological community began to theorize that children could develop psychological disorders even if they had not yet developed a superego. The *DSM-II* included a section entitled "Behavior Disorders of Childhood and Adolescence" (Anastopoulos 2001). This section of the *DSM-II* included a disorder called Hyperkinetic Reaction of Childhood (or Adolescence). This disorder was characterized by symptoms of over-activity, restlessness, distractibility, and short attention span. According to the *DSM-II* these symptoms typically diminish during adolescence and were not the result of organic brain damage (Anastopoulos 2001).

The *DSM-III* was published in 1980. It marks the first time that over-activity, distractibility, short attention span, and other AD/HD-like symptoms were labeled
Attention Deficit Disorder as well as the first time that impulsivity was listed as part of the diagnostic criteria for this disorder. The official name of the disorder in the *DSM-III* was Attention Deficit Disorder with Hyperactivity.

The diagnostic criteria for Attention Deficit Disorder with Hyperactivity were divided into three categories— inattention, hyperactivity, and impulsivity. The diagnostic criteria were more detailed than the criteria for Hyperkinetic Reaction of Childhood (or Adolescence). The purpose of this was to help eliminate false positive results and to increase the overall reliability of the diagnosis. Age limitations were also clearly defined (see Table 3).

Table 3—This is the diagnostic criteria for Attention Deficit Disorder with Hyperactivity as described by the *DSM-III*.

**DSM-III:**

*Diagnostic Criteria for Attention Deficit Disorder with Hyperactivity:*

_A. Inattention. At least three of the following:_

1. often fails to finish things he or she starts
2. often doesn't seem to listen
3. easily distracted
4. has difficulty concentrating on schoolwork or other tasks requiring sustained attention
5. has difficulty sticking to a play activity

_B. Impulsivity. At least three of the following:_

1. often acts before thinking
2. shifts excessively from one activity to another
3. has difficulty organizing work (this not being due to cognitive impairment)
4. needs a lot of supervision
5. frequently calls out in class
6. has difficulty awaiting turn in games or group situations
C. Hyperactivity. At least two of the following:
   1. runs about or climbs on things excessively
   2. has difficulty sitting still or fidgets excessively
   3. has difficulty staying seated
   4. moves about excessively during sleep
   5. is always "on the go" or acts as if "driven by a motor"

D. Onset before the age of seven.
E. Duration of at least six months.
F. Not due to Schizophrenia, Affective Disorder, or Severe or Profound Mental Retardation.

Table 3—continued

After the publication of the DSM-III there was a large debate in the psychological community about how the symptoms of Attention Deficit Disorder with Hyperactivity clustered together. There was a lack of agreement on whether or not the impulsivity component of Attention Deficit Disorder with Hyperactivity was a part of its own group of symptoms. Some psychologists believed impulsivity represented a category of symptoms separate from inattention and hyperactivity. Others believed that the criteria for impulsivity should be grouped together with the criteria for hyperactivity (Anastopoulos 2001). This resulted in the elimination of the clusters of diagnostic criteria that were presented in the DSM-III.

This debate was addressed in 1987 with the publication of the DSM-III-R. To satisfy both sides of the debate over clustering of symptoms, the DSM-III-R eliminated clusters of diagnostic criteria. There was simply one long list of criteria presented in descending order of discriminating power (see Table 4). The DSM-III-R provided criteria for labeling the severity of the Attention Deficit Hyperactivity Disorder. This is the first time that Attention Deficit Hyperactivity Disorder was officially labeled as such.
**DSM-III-R:**

Revised diagnostic criteria for Attention Deficit Hyperactivity Disorder:

A. A disturbance of at least six months during which at least eight of the following are present:

1. often fidgets with hands or feet or squirms in seat (in adolescents, may be limited to subjective feelings of restlessness)
2. has difficulty remaining seated when required to do so
3. is easily distracted by extraneous stimuli
4. has difficulty awaiting turn in games or group situations
5. often blurts out answers to questions before they have been completed
6. has difficulty following through on instructions from others (not due to oppositional behavior or failure of comprehension), e.g., fails to finish chores
7. has difficulty sustaining attention in tasks or play activities
8. often shifts from one uncompleted activity to another
9. has difficulty playing quietly
10. often talks excessively
11. often interrupts or intrudes on others, e.g., butt into other children's games
12. often does not seem to listen to what is being said to him or her
13. often loses things necessary for tasks or activities at school or at home (e.g., toys, pencils, books, assignments)
14. often engages in physically dangerous activities without considering possible consequences (not for the purpose of thrill seeking), e.g., runs into street without looking

B. Onset before the age of seven.

C. Does not meet criteria for a Pervasive Developmental Disorder

**Mild:** Few, if any, symptoms in excess of those required to make the diagnosis and only minimal or no impairment in school or social functioning.

**Moderate:** Symptoms or functional impairment intermediate between "mild" and "severe."

**Severe:** Many symptoms in excess of those required to make the diagnosis and significant and pervasive impairment in functioning at home and school and with peers.

| Table 4 | This is the diagnostic criteria for Attention Deficit Hyperactivity Disorder as described by the DSM-III-R. 

Research conducted between 1987 and 1994 helped solve the debate over the clustering of symptoms resulting in the separation of diagnostic criteria for Attention Deficit Hyperactivity Disorder (see Table 5). Research revealed that hyperactivity
symptoms and impulsivity symptoms tended to cluster together separate from inattention symptoms (Anastopoulos 2001). This research was reflected in the DSM-IV. The diagnostic criteria in the DSM-IV are the same as the diagnostic criteria in the current edition of the DSM, the DSM-IV-TR which was published in 2000. Currently, there are a total of 18 symptoms for Attention Deficit/Hyperactivity Disorder.

**Table 5** - This is the diagnostic criteria for Attention Deficit/Hyperactivity Disorder as described by the DSM-IV and the DSM-IV-TR.
2. Six (or more) of the following symptoms of hyperactivity-impulsivity have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Hyperactivity:

a. often fidgets with hands or squirms in seat
b. often leaves seat in classroom or in other situations in which remaining seated is expected
c. often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
d. often has difficulty playing or engaging in leisure activities quietly
e. is often “on the go” or often acts as if “driven by a motor”
f. often talks excessively

Impulsivity:

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

B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.

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

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

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

Table 5 (continued): This is a continuation to the diagnostic criteria for Attention Deficit / Hyperactivity Disorder as described in the DSM-IV and DSM-IV-TR.

AD/HD Treatments

There are a variety of potential treatments for children who suffer from AD/HD.

The most common form of treatment for AD/HD is drug therapy with stimulant medications. Brand name stimulants such as Ritalin, Concerta, Adderall, and Focalin are the common choices for use in drug therapy. Various forms of counseling therapy, such as individual and family counseling, are also effective in treating AD/HD. Active
parenting is another widely discussed form of treatment for AD/HD. There are several diet plans available for children suffering from AD/HD as well, and herbal remedies for treating the symptoms of AD/HD are becoming popular.

AD/HD is typically treated with psychomotor stimulants. Most psychomotor stimulants are classified as Schedule II drugs by the FDA Controlled Drug Schedule. Schedule II drugs are considered to be medications that have therapeutic uses and have the highest potential for abuse and dependency compared to other medicinal drugs (www.resultspoint.net). Psychomotor stimulants work by blocking the reuptake of dopamine in the brain. The excess dopamine often helps to create a sense of euphoria. For example, when most people experience something pleasurable, like eating ice cream, neurons release dopamine into the brain. The dopamine travels across the synapse to a dopamine receptor which then creates a pleasant sensation. Once the dopamine has reached the receptor and sent the pleasurable signal, autoreceptors, which transport dopamine, gather the excess dopamine left in the synapse and return it to the neuron that sent it (see Figure 1).

Stimulants such as the one found in Ritalin prevent up to 70% of these autoreceptors from being released (see Figure 2). This leaves excess dopamine in the synaptic cleft. The excess dopamine continues to stimulate the dopamine receptor creating a longer lasting effect of euphoria. It is theorized that children who have AD/HD have an imbalance of dopamine in their brains; the increase in dopamine that is produced by stimulants over stimulates the dopamine receptors to ensure that a message gets sent on letting the rest of the body know that something pleasurable just occurred.
Dopamine cycle in the average human brain.

Figure 7: This is an image of the normal

Dopamine receptor. This sends a message to the

Dopamine neurons. The dopamine receptor

causes the release of dopamine.

A pleasurable experience causes the release of dopamine.
Methyphenidate.

Figure A: This is an image of dopamine.

Glye in the brain of an individual taking

The dopamine receptor.

Dopamine continues to stimulate

Excess dopamine in the synapic cleft. The synapic cleft then sends a message to the rest of the synapic cleft. The dopamine receptor

Causes the synapic to release dopamine into

As in Figure 1, a pleasurable experience has occurred.

\[
\text{Dopamine} = \text{Dopamine} + \text{Methyphenidate}
\]
Ritalin, one of the most-prescribed stimulants, is the oldest stimulant medication on the market. Methylphenidate is the stimulant drug found in Ritalin; it was derived from Dexedrine in the 1950's (www.add-adhd-help-center.com). Methylphenidate has been shown to be effective in treating AD/HD in more than 200 studies since it was first introduced (HR 1170 Hearings). Ritalin is effective at controlling behavior for short periods of time and must be taken more than one time each day in order to remain effective (www.add-adhd-help-center.com). Common side effects of Ritalin use include headaches, abdominal pain, nervousness, insomnia, dizziness, irregular heartbeat, and weight loss (www.add-adhd-help-center.com).

Concerta is one of the newer stimulant drugs available for treating AD/HD. The stimulant found in Concerta is methylphenidate, the same medication found in Ritalin. Concerta is a redesigned pill which allows for the release of stimulants into the bloodstream slowly over time (www.concerta.net). Because of the time-release element of Concerta, it has become the number one drug prescribed for AD/HD treatment in the nation (www.concerta.net). One dose of Concerta works effectively for 12 hours which eliminates the need for a second dosage. However, because Concerta is just another form of Ritalin the two have similar side-effects. Additional side effects from Concerta include upper respiratory infections, vomiting, loss of appetite, sleeplessness, increased cough, sore throat, and sinusitis. Although rare, reduced stature, tics, moodiness, and psychosis are also potential side-effects of Concerta (www.add-adhd-help-center.com).

Adderall is another more recently developed stimulant drug available for treating AD/HD. Adderall is a combination medication of amphetamine and dextroamphetamine (www.whatmeds.com). This combination of stimulants effectively treats the symptoms
of AD/HD for up to six hours (www.add-adhd-help-center.com). This means that there is no concern of the medication wearing off while the child is at school, and there is no need for the child to take a second dose while at school which helps to eliminate some of the stigma associated with AD/HD. The side-effects of Adderall are similar to those of Ritalin and Concerta, and they also include restlessness, dizziness, insomnia, headache, dry mouth, and weight loss.

Focalin is the newest of the stimulant medications available for treating AD/HD. The stimulant in Focalin is dexamethasphenidate, a derivative of methylphenidate, the stimulant in Ritalin (Adis International, Ltd. 2002). Dexamethasphenidate works by inhibiting norepinephrine and dopamine in the brain which can have a calming effect on and AD/HD child. Focalin effectively works to treat AD/HD symptoms at half of the dose of Ritalin. It is prescribed in 2.5 mg doses, 5 mg doses, and 10 mg doses, so the maximum dosage a person would be prescribed is 20 mg/daily (Adis International, Ltd. 2002). The side-effects associated with Focalin are rare and include abdominal pain, chest pain, increased cough, and headache (Adis International, Ltd. 2002).

Although they are rare, the side effects of the stimulant medications used to treat AD/HD are unpleasant and raise concerns. The majority of the people receiving stimulant medications are young children who are still growing and developing, yet weight loss and reduced stature are potential side effects of some of the medications being used. These side effects are potentially dangerous to developing children. The concern about the side effects of stimulant medications has resulted in the exploration and development of alternative treatments for AD/HD. Individual and family therapy, active parenting, diets, and herbal treatments have become popular alternatives to
stimulant medications.

Individual and family therapy with a cognitive/behavioral perspective can be very useful in treating AD/HD (Clawson, 2003). Cognitive/behavioral therapy focuses on identifying negative cognitions and behaviors and then replacing them with positive cognitions and behavior alternatives. With AD/HD this can be an effective way to control certain behaviors in certain settings. For example, through cognitive therapy children suffering from AD/HD have the ability to learn the self-control necessary to eliminate outside distractions while they are at school. This form of treatment is effective in minimizing certain symptoms of AD/HD; however, it does not completely eliminate symptoms.

Involved and active parenting is viewed as another form of treating AD/HD. Being an involved and active parent encompasses a variety of skills. Active parents need to be able to identify potential stressors in their children's lives and teach them proper coping skills for these stressors (Romm & Romm 2000). These stressors include school work, conflict within the home, conflicts with friends and peers, and peer pressure. In addition, active parents should teach their children how to identify their feelings (Romm & Romm 2000). The ability to identify feelings is the first step in being able to effectively cope with those feelings. Proper coping strategies for stressors and feelings are an effective way of reducing inattention and distractibility in children.

Active parenting also involves modeling appropriate behavior for children in all situations (Romm & Romm 2000). Proper behavior for the home is distinctly different from proper behavior on a playground. Children can learn the differences if their parents model those. Parents can also model appropriate classroom behaviors for their children.
when they are assisting their children with homework. Along with modeling appropriate behavior, discipline and boundaries should be established by parents (Romm & Romm 2000). In order for this to be effective, parents must be clear and consistent with their children. The expectations for their children should also be reasonable for each individual child and his or her level of cognitive development. In general, children should also be kept on a consistent schedule which includes a healthy combination of physical activity to release excess energy and sedentary activity to provide some quiet time (Romm & Romm 2000).

Basic dietary changes also can be effective in minimizing or eliminating certain symptoms of AD/HD. The average child in the United States eats a breakfast filled with sugar and carbohydrates. The problem with this is two-fold. The energy provided from sugar burns very fast which leaves the child experiencing low blood sugar. Low blood sugar can lead to fatigue, irritability, and an inability to focus (Romm & Romm 2000). However, a breakfast that consists of protein and complex carbohydrates could help to solve inattention problems at school. Proteins and complex carbohydrates provide the body with a slow burning source of energy which helps to maintain a consistent metabolic rate (Romm & Romm 2000). There is no crash from the sugar and no adrenaline boost as a response; therefore, behavior is likely to remain more consistent throughout the day.

An increase in certain vitamins and minerals is another dietary change that may potentially help to control the symptoms of AD/HD. A study conducted by Starobrat-Hermelin in 1998 indicated that increased doses of magnesium, zinc, and calcium helped to control hyperactive actions in children with behavior problems (www.healing-
It is unclear why these things worked to improve symptoms of AD/HD. In a 1979 study conducted by Coleman, et al, a dietary increase in vitamin B6 was shown to reduce hyperkinetic activity in children (www.healing-arts.org/children/herbal.htm). These are just a few of the basic dietary changes that could potentially help to minimize or eliminate some symptoms of AD/HD.

The Feingold Diet is designed specifically for children who have behavior problems. The Feingold Diet was designed in the 1960's by Dr. Ben Feingold (Romm & Romm 2000 & www.feingold.org). This diet eliminates petroleum-based additives such as artificial food dyes and flavors. It also eliminates petroleum-based preservatives such as BHA, BHT, and TBHQ and foods and non-food products that contain salicylate. Studies which have evaluated the Feingold Diet and other similar diets have shown a wide range of response from the children participating. The response rates have been as low as 50% as was found in a 1989 study conducted by Kaplan; however, the response rates have been as high as 89% as was found in a 1980 study by Swanson (www.feingold.org).

Overall, the research suggests that approximately 50% of children participating in the Feingold Diet illustrate a decrease in hyperkinetic symptoms (Romm & Romm 2000). The Feingold Diet has been well researched; however, none of the research has produced an explanation for its effectiveness (www.feingold.org). It is possible that the diet works because of a placebo effect. Parents who have placed their children on the Feingold Diet expect to see an improvement in the behavior of their children. Even with no improvement, this expectation may cause parents to report that there was an improvement in behavior. Children on the Feingold Diet may also alter their behavior because they are
expecting the diet to have an effect on it.

Herbal remedies are also becoming a popular alternative treatment for AD/HD. One of the more popular herbal remedies is caffeine. Caffeine works much in the same way that traditional stimulant treatments work. Caffeine is simply used as a substitute stimulant for traditional stimulant medications such as methylphenidate (www.healing-arts.org/children/herbal.htm).

Siberian Ginseng is another popular herbal remedy. It serves to normalize physiological functions such as metabolism which in turn increases attention span and overall work output (www.healing-arts.org/children/herbal.htm).

Ginkgo Biloba is one of the most popular herbal treatments to address the symptoms of AD/HD. Ginkgo Biloba increases blood flow and oxygenation to the brain. It also helps to increase glucose metabolism (www.healing-arts.org/children/herbal.htm). These actions combine to help reduce hyperkinetic symptoms of AD/HD and to help reduce the inattention symptoms.

Case Study

William, Jr. is a ten-year-old boy from Connecticut who was recently diagnosed with AD/HD. He was officially observed for two months during the Summer of 2003 after beginning treatment for AD/HD. William, Jr. was observed in several different settings, and interviews were conducted with William, Jr. and his family to obtain additional information.

William, Jr. was born a healthy baby in January 1994 to Heidi and William, Sr. There were no complications during the course of the pregnancy and delivery.

William’s mother and father were 19 at the time of his birth. William, Jr. was an
unplanned pregnancy. William’s mother and father married as a result of the pregnancy. Their marriage was unstable and short-lived. William’s mother and father obtained a divorce when he was three years old. Since the divorce, William’s mother has remained the custodial parent for him. William’s father has maintained a healthy relationship with William and has had regular visitation with him including weekends and holidays for the past seven years.

At approximately the same time as the divorce, William, his mother, and his mother’s boyfriend, Pete moved into an apartment. Pete played an influential role in William’s life from the time he was three years old until he was nine. William even called Pete “Daddy Pete.”

William began school in the Fall of 1999. Like any normal five year old child, William was excited to go to school; however, he quickly developed problems in school. He had a difficult time paying attention and completing his school work. Teachers began to suspect Attention Deficit/Hyperactivity Disorder. In the Fall of 2001, William was evaluated for and diagnosed with AD/HD. William was diagnosed with AD/HD by his family doctor.

Teachers expressed concern to William’s mother regarding his behavior in the classroom. One teacher recommended that William’s mother speak to his pediatrician. William’s mother scheduled an appointment for him to see his doctor. After a short doctor’s visit, William left with a diagnosis for AD/HD; however, rather than leaving with a prescription for stimulant medications, William left with a plan for alternative treatments. They first tried the alternative treatments because there was concern about the potential long-term effects of medications. Prior to placing William on Concerta, his
mother attempted alternative methods of treatment with varying levels of success. She tried to simply become an involved and active parent. The increased amount of attention that William received from his mother helped to improve his behavior; however, there were still behavior issues while at school.

William's mother also tried the "Coke Diet" with William. While on this diet, William had a soda with his breakfast in the mornings prior to going to school. He also carried a can of soda to school. William was allowed to drink that soda during his lunch time. The purpose of drinking the soda was to provide caffeine, a substitution for other forms of stimulants. William's mother reported that this method of treatment actually worked with William; however, she stopped the caffeine treatments because she became concerned with her son's dental health. Consequently, she decided to utilize drug therapy.

William is taking 10 mg of Concerta daily during the school year to treat his AD/HD symptoms. He stops taking the medication in the summer and while on extended breaks from school to help prevent any long-term side-effects such as a reduction in overall growth. While on the medication there are dramatic improvements in William's behavior. His teachers report that he remains on task while in school and completes his assignments without any problems. His grades have improved since he began taking Concerta. While at home, William completes his homework and is capable of focusing on games and activities with his friends.

It appears that the medication is very effective for William; however, there is always the possibility of a placebo effect. Before William began taking Concerta, his mother and his pediatrician both spoke to him and explained why he needed to take
Concerta. He was informed that the medicine he was going to be given would improve his ability to pay attention to his school work and what he was doing. Since William knows what the medication is supposed to do, there is the possibility that his behavior has improved simply because he expected that it would.

William meets the diagnostic criteria for AD/HD as it is described in the DSM-IV-TR. He exceeds the necessary diagnostic criteria for the inattention component of AD/HD and meets the necessary minimum criteria for the hyperactivity-impulsivity component of AD/HD. This makes the official diagnosis for William Attention Deficit/Hyperactivity Disorder, Primarily Inattentive.

William frequently fails to give close attention to details and makes careless mistakes in school work. When reviewing his homework and school work, it can be seen that William often omits letters when he is writing or completing spelling homework. He also has a habit of skipping over homework questions or leaving the answers incomplete. When these omissions are pointed out to him, he often acts as though he did not even realize the problem existed.

William also has a difficult time sustaining attention in tasks and play activities. For example, William plays baseball for a little league team in the Spring and Summer months. While William’s team is in the field, he is often oblivious to what is going on around him. He can be observed picking grass, looking at insects, playing with dirt, or trying to talk to his mother. William has a complete understanding of the game of baseball, and he is aware of what it is that he is supposed to do while out in the field. He is capable of performing these tasks for a short period of time; however, he quickly loses interest.
William also does not seem to listen when spoken to directly. He looks around and avoids eye contact with the person speaking. When the person is done speaking, William will turn to this person with a surprised look on his face and say, “Huh?” He will then seem confused, and the entire conversation needs to be repeated.

School work and chores are always difficult for William. While working on homework, William will leave his seat and start doing something else. When questioned about his homework, he again looks confused and then states, “Oh yeah; I forgot.” He then continues to work on his homework for another ten minutes, and then the same pattern is repeated. A similar pattern occurs when he is working on his chores.

Organizing tasks and activities is another problem area for William also. When asked to work on his homework, William does not know where to begin. Once he decides which assignment he is going to begin, he will work on it for a short period of time, and then move on to another assignment before he has completed the initial project which suggests that William does not like to participate in activities that require sustaining attention for an extended period of time. William will tell anyone he talks to that he really likes to play baseball, but every time he has a game or practice, he will argue and say that he does not want to go. He will pretend to be sick if he thinks that it will relinquish his responsibilities.

While playing William has a hard time waiting for his turn. This can be seen in a lot of his interactions with his peers. For example, when playing a game, William always wants to be the person to go first and, then is quick to try to skip his peers so that he can have another turn.

William also loses items necessary to complete tasks and activities. When he
returns home from school, he spends twenty to thirty minutes finding his books, pencils, paper, assignment sheet, and other items that he needs to complete his homework. In addition to spending time to locate these items, as soon as he finds one item that he needs, he loses another. The same is true of his equipment for baseball and his toys in general.

Extraneous stimuli easily distract William. For example, during a dinner cookout one evening, William spotted a squirrel in a nearby tree. He asked if he could feed the squirrel. He was granted permission. William left the table to feed the squirrel. For the remainder of the meal, William would leave his seat every few minutes to feed or chase the squirrel. As a result of his distraction, William took a full two hours to finish his dinner that evening. This is not an unusual occurrence. Meals often take William longer than necessary because he quickly becomes distracted by something. William also has a difficult time remaining seated in the classroom. In the past his teachers have reported that he frequently leaves his seat.

William is generally forgetful. While playing, he will set a toy down, and a short time later he has forgotten where it is. The same is true of his school work and books. William is also forgetful when it comes to personal hygiene. For example, William has to constantly be reminded to brush his teeth.

William also has a tendency to run around in inappropriate situations. For example, William’s mother will occasionally bring him to work with her when she cannot find a sitter. While at his mother’s job, William is expected to remain in the back office and play videogames, watch a movie or do something else that will not be disruptive to the customers or employees. William is fully aware of these rules; however, after a short
period of participating in quiet activities, William runs through the store and climb on or hangs in the racks of clothing. In other words, William is almost always on the go.

Another behavior problem of William’s is his constant need to talk. He is full of questions. William always wants to know why and how things work. When he is excited and has a story to tell, he cannot wait; his story has to be told at that specific moment. When he shares his story, he speaks rapidly. It is as though he cannot get the words out fast enough.

William also has a habit of interrupting conversations. If his mother is talking to another person, and there is something that William feels he needs to tell her, he will interrupt her conversation to do so. When his mother tries to ignore him or make him wait, he will stand at her side and pull at her arm until she acknowledges him.

All of these symptoms were noticeable when William was in kindergarten and first grade. His teachers began to mention to his mother that his behavior was not appropriate and that it might be due to an inability to pay attention. William’s mother also noticed at home and during play that he was having a hard time staying focused on one specific task or activity.

William’s difficulties have resulted in his placement in special educational courses in two different schools. His inability to stay on task and complete his work has brought down his grades and made it difficult for him to keep up with his classmates. William does not have any other known psychological disorder or medical condition that could be responsible for his behavior difficulties.
How is the Issue of Misdiagnosis Being Addressed?

To help ensure that children are being properly diagnosed and treated, the United States House of Representatives has formed a committee to discuss AD/HD. At a committee hearing in September of 2002, the President of the Citizens Commission on Human Rights - Bruce Wiseman - recommended that federal legislation be created that would prevent parents from being coerced into putting their children on medication for Attention Deficit/Hyperactivity Disorder (Senate Hearing). In 2003, the House of Representatives created the Child Medication Safety Act which states, “Each state shall develop and implement policies and procedures prohibiting school personnel from requiring a child to obtain a prescription for substances covered by section 202(c) of the Controlled Substances Act.”

Since the release of the Child Medication Safety Act, states such as Connecticut and Rhode Island have created laws for this purpose. In Connecticut it is illegal for teachers to recommend methylphenidate to parents as a way of treating AD/HD (Source 4). Rhode Island created the Individuals with Disabilities in Education Act which made it illegal to require medication as a condition for attending school (Senate Hearing).

Conclusion

Attention Deficit/Hyperactivity Disorder is a serious disorder which affects a large number of children. The symptoms are ambiguous and there is ample room for misdiagnosis. The long term effects of stimulant therapy are unknown and need to be further explored if children are going to continue to be treated with stimulants. Steps are being taken to ensure that the process of diagnosis is accurate; however, there is still work to be done in this area.
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