Hypothesis /Prediction

Question:

Is there consistency in the diagnosis of ADD (Attention Deficit Disorder) among children and if there isn’t consistency are some methods more effective than others?

Hypothesis:

There isn’t consistency in the diagnosis of ADD among children and some diagnosis procedures seem to be more effective than others.

Prediction:

If different doctors diagnose ADD using different procedures than there would not be consistency in the diagnosis of ADD. If some methods of diagnosis provide children with the correct disorder and treatment for their symptoms and other methods sometimes fail to provide children with the correct disorder and medication for their symptoms than some methods of diagnosis are more effective than others.

Introduction

“London – In a major report form the British Psychological Society, British physicians and psychologists are warned not to follow the Canadian and U.S. practice of applying the label attention deficit hyperactivity disorder (ADHD) to such a wide variety of behaviors in children.”(<http://www.mentalhealth.com/imh-logo.gif>)

Attention deficit disorder, a disorder that has brought about such a wide variety of conflicting theories of its causes, is a disorder that not many people really know about. Quite a few of my high school friends have been diagnosed as having attention deficit disorder. Some of these students have had it ever since they were 5 years old. I asked a few of them to describe to me what the cause of their disorder was and to describe to me what the disorder means. I was not prepared for the shock I received when all of them couldn’t tell me what exactly their disorder was. They only had a vague idea of their disorder but none of them could actually describe to me exactly why they had ADD and what the medicine they were taking was for. They knew that the medicine helped them concentrate, but that is about all they knew about the medicine they have been consuming every day of their life for quite a few years.

This is when I decided that I wanted to research ADD. I felt that it was not right for so many children to have this disorder and not really know much about it. I almost seemed to me like nobody knew much about it. The name ADD is widely know but mostly misused. I wanted to get down to the actual facts behind this controversial disease. I wanted to know for myself if this disease was correctly diagnosed. My search for a research project revealing either the careful or careless diagnostic procedures for ADD began. I started out my project with the thought that there exists too much carelessness in the diagnosis of ADD. Than I thought that there has to be a method of diagnosing the disorder that must prevail. So I came up with my final question for my research project: Is there consistency in the diagnosis of ADD (Attention Deficit Disorder) among children and if there isn’t consistency are some methods more effective than others?

With my determined question I set out to educate myself about the disease. I searched different books and numerous web pages in order to find out what ADD is and I came out with a variety of mixed theories.

One definition of the disease that I came across is “A neurobiological condition characterized by developmentally inappropriate level of attention, concentration, activity, distractibility, and impulsivity.” (<http://health.yahoo.com/health/dc/00151/0.html>)

According to one source there are three sub-categories of Attention deficit Disorder:

Attention deficit/hyperactivity disorder: combined type

Attention deficit/hyperactivity disorder: predominantly inattentive

Attention deficit/hyperactivity disorder: predominantly hyperactive or impulsive

Scientists have determined that there is a neurobiological basis for the disease and this theory has shown throughout my research. My research also showed me that some cases of ADD are due to genetics.

An article I read stated “A new theory suggests the disorder results from a failure in self-control. ADHD may arise when key brain circuits do not develop properly, perhaps because of an altered gene or genes.” (<http://www.sciam.com/1998/0998issue/IMG/0998barkley_in_air.jpg>)

Research has found out that ADHD is not really a disorder of attention, but it is rather a developmental failure in the brain circuitry that underlies inhibition and self-control. Because there is lack of self-control other important brain functions crucial for maintaining attention are affected, including the ability to yield instantaneous rewards for later, better gain.

Imaging studies of the brain have been used to study what part of the brain might malfunction within patients with ADHD. If this part of the brain would be found than it would account for the symptoms of the conditions. These studies suggest the involvement of the prefrontal cortex, part of the cerebellum, and at least two of the clusters of nerve cells deep in the brain that are collectively known as the basal ganglia. In 1996 it has also been found by F. Xavier Castellanos, and Judith L. Rapoport that the right prefrontal cortex, the vermis region of the cerebellum, and two basal ganglia called the caudate nucleus and the globus pallidus are significantly smaller than normal in children with ADHD. These areas of the brain are the ones that regulate attention. The right prefrontal cortex is involved in resisting distractions and developing an awareness of self and time, the caudate nucleus and the globus pallidus help to switch off automatic responses to allow more careful calculation by the cortex and to coordinate neurological input among various regions of the cortex. It is unknown why these structures are smaller in the brains of those with ADHD but it is suggested that it is due to mutations in genes. This is not necessarily the cause of ADD; it is just a hypothesis.

Another theory about the causing agent of ADD has been found. NIMH (National Institute of Mental Health) scientists demonstrated a link between a person’s ability to pay continued attention and the level of activity in the brain. Adults were asked to learn a list of words and while they learned the list of words scientists used a PET positron emission tomography) scanner to observe the brain at work. Researchers observed the level of glucose used by the areas of the brain that inhibit impulses and control attention. This was done because Glucose is the brain’s main source of energy and the amount of glucose used is a good indicator of the brain’s activity level. In people with ADHD the brain areas that control attention use less glucose indicating that their activity is less. This research indicates that a lower level of activity in some parts of the brain may cause inattention.

The next step in the research of brain activity in ADHD patients is to see why there is less activity in these areas of the brain. Researchers want to compare mild to sever cases of ADHD in order to see the relationship of ADHD and brain activity.

Researchers are also searching for other differences between the brain of people without ADHD and people with the disorder. They are studying the way the brain develops in the fetus in order to come to a conclusion to what might disrupt the process. Throughout pregnancy and through the first year of life the brain is constantly developing. It grows from a few cells and evolves into a complex organ made of billions of specialized, interconnected nerve cells. Scientists at the NIMH and other research facilities are trying to figure out what is causing nerve cells from connecting the proper way.

After reading all of this material about brain activity and ADHD from the web page ([www.mentalhealth.com](http://www.mentalhealth.com)) I have a question of my own to ask: Why do the symptoms of ADD typically begin only by 3 years of age and up? I have not seen this question answered in any of the material I have read and I think it is important for doctors to address this in their research.

Some causes of the “incorrect wiring” of the nerve cells in the brain can be drug use during pregnancy, toxins, and genetics. Research for many years has shown that drug use during pregnancy has damaging effects for the unborn child. They can cause the unborn child to develop improperly. If the brain develops improperly in the unborn child than it could be a cause of the “incorrect wiring.” Alcohol and nicotine use during pregnancy may distort developing nerve cells. Cocaine seems to affect the normal development of brain receptors in an unborn child. Brain receptors help transmit incoming signals from skin, eyes, and ears, and help control responses to the environment. Toxins in the environment, such as lead, can also disrupt brain development. The last cause of the improper connection of nerve cells in the brain could be genetics because attention disorders tend to run in families. Children with ADHD have at least a close relative with ADHD and the majority of identical twins share the trait.

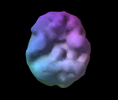
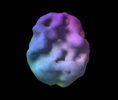
Another study, by Joel Lubar from the University of Tennessee, showed that when ADD children and teenagers performed a concentration task there was an increased amount of slow brain wave activity in the frontal lobes compared to the usual increase in fast brain wave activity that was seen in most of the control group of patients without ADD. SPECT imaging drew the same conclusions. At rest ADD people have normal activity in the brain, and when they try to concentrate they experience decreased activity in the prefrontal cortex rather than the expected increase that is seen in the normal group of patients.

“What is SPECT? It is an acronym for Single Photon Emission Computerized Tomography. It is a sophisticated nuclear medicine study that looks directly at cerebral blood flow and indirectly at brain activity (or metabolism). In this study, a radioactive isotope is bound to a substance that is readily taken up by the cells in the brain.” ([www.brainplace.com](http://www.brainplace.com)) This isotope is injected into a person’s bloodstream and then the SPECT camera slowly rotates around the patients head taking 3-D images of brain activity levels. These maps help physicians identify certain patterns of brain activity that accompany psychiatric and neurological illnesses. CAT scans and MRI studies are newer methods of looking at the brain, but none of these methods can show how the brain actually functions.

Just like a finding by Xavier Castellanos and Judith L. Rapoport the Dr.Amen has also found that the basal ganglia seems to be smaller in ADD patients. This region produces a large amount of dopamine. It also has a significant number of nerve passages that go through the limbic system to the prefrontal cortex. When there is not enough dopamine available in the basal ganglia then there is not enough needed energy to make the frontal lobes activated with concentration.

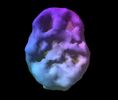
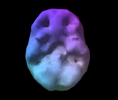
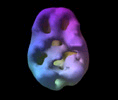
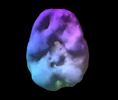
This site also states, like a previous site, that besides the genetic contribution to ADD, maternal alcohol or drug use, birth trauma, jaundice, brain infections and head trauma sometimes can cause ADD.

Dr. Amen has created the site [www.brainplace.com](http://www.brainplace.com) and he is a specialist in the brain activity area. Many doctors I have talked to know about him and he is very respected in his practice. He has found 5 clinical subtypes of ADD with the brain imaging procedure. He believes that it is essential to know that ADD is a developmental disorder that can be diagnosed through clinical history over a prolonged period of time. In his opinion brain imaging is not necessary to make the diagnosis of ADD, but thinks that it may be helpful in certain complicated cases.

The first type of ADD Dr. Amen has noticed is AD/HD, combined type. I have found this type of ADD as a subtype on another site dealing with ADD. This type of ADD is when children are both hyperactive-impulsive and inattentive. Brain SPECT imaging usually shows decreased activity in the basal ganglia and prefrontal cortex during a concentration task. Psychostimulant medication seems to work best for this type of ADD.

[undersurface view, rest](http://viewlargeimage.asp?img=ADD1.jpg) undersurface view, concentration undersurface view, w/Adderall   
mild decrease prefrontal area marked decrease prefrontal cortex overall marked improved activity. and left temporal lobe

The second type of ADD is AD/HD, primarily inattentive subtype. This type of ADD I have seen on another site as a subtype of ADD. It deals with symptoms of inattention and also chronic boredom, decreased motivation, internal preoccupation and low energy. Brain imaging shows decreased activity in the basal ganglia and dorsal lateral prefrontal cortex during a concentration task. Psychostimulant medication seems to work best for this type of ADD.

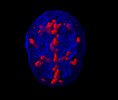
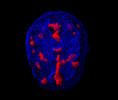
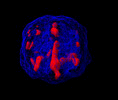
Undersurface view, Undersurface view, Undersurface view, Undersurface view, 

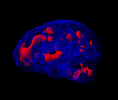
No Meds, with marked overall No Meds, w/Ritalin,

poor prefrontal improvement overall severe overall marked

and temporal decreased improved activity

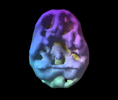
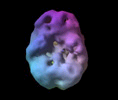
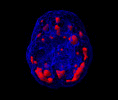
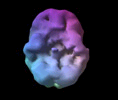
lobe activity

Overfocused ADD has symptoms of trouble shifting attention, cognitive inflexibility, difficulty with transitions, excessive worrying, and oppositional and argumentative behavior. Symptoms of inattention and hyperactivity-impulsivity are also seen. Brain images show increased activity in the anterior cingulate gyrus and decreased prefrontal cortex activity. Medications that enhance serotonin and dopamine availability in the brain (venlafaxine, or combination of and SSRI (fluoxetine or sertaline) as a psychostimulant) are best for this type of ADD.

Front on active view Active top down Top down active Active side view 

# Increased cingulate view view Increased cingulate

Increased cingulate Increased cingulate

Temporal lobe ADD has symptoms of inattention and /or hyperactivity-impulsivity and mood instability, aggression, mild paranoia, anxiety with little provocation, atypical headaches or abdominal pain, visual or auditory illusions, and learning problems ( especially reading and auditory processing). Brain SPECT imaging typically shows decreased or increased activity in the temporal lobes with decreased prefrontal cortex activity. Aggression is more common with left temporal lobe abnormalities. Anticonvulsant medications (gabapentin, divalproate, or carbamazepine and a psychostimulant) are best for this type of ADD.

Undersurface view Underside active view Undersurface view Undersurface

Decreased left Increased left marked decreased view

temporal lobe temporal lobe left temporal lobe marked

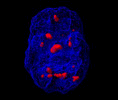
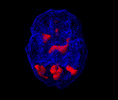
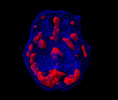
Activity. Decrease

Temporal and

prefrontal

cortex

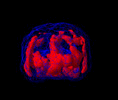
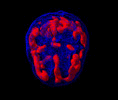
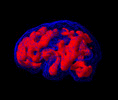
bilaterally

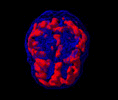
Limbic ADD symptoms are inattention and or hyperactivity-impulsivity and negativity, depression, sleep problems, low energy, low self-esteem, social isolation, decreased motivation and irritability. Brain images show increased central limbic system activity and decreased prefrontal cortex activity. Medicine that should be used for this type of ADD should be stimulating antidepressants such as buprion and imipramine, or venlafaxine if obsessive symptoms are present. 

Underside active view underside active view underside active view

Increased limbic activity increased limbic activity marked increased limbic,

Basal ganglia and cingulate

Ring of Fire ADD is very common in children and teenagers. They often don’t respond to psychostimulant medication and in many cases are made worse by them. They tend to improve with either anticonvulsant medication (Depakote or Neurotin, or Risperdal or Zyprexa). Symptoms include severe oppositional behavior, distractibility, irritability, temper problems and mood swings. The Amen Clinic believes it may represent an early bipolar pattern.

Top down active active front on view top down active view left side active view

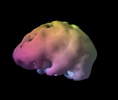
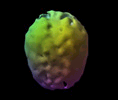
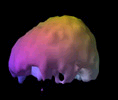
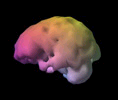
view, increased activity increased activity increased activity in the increased activity

in the cingulate, in the cingulate, cingulate, lateral in the cingulate,

lateral parietal, frontal lateral parietal, parietal, frontal and lateral parietal,

and temporal frontal and temporal temporal frontal and temporal

Trauma Induced ADD is the last type of ADD described at [www.brainplace.com](http://www.brainplace.com). Symptoms come on or intensify in the year after a head injury. Psychostimulant medication may be helpful, but if irritability results the addition of a low dose anticonvulsant may be helpful.



Top down surface side surface view side surface view side surface view

View marked decreased decreased left decreased left

marked decreased left and anterior prefrontal prefrontal and

left front prefrontal temporal region temporal lobe activity

and occipital lobes

The images I have shown after each of the different types of ADD are brain SPECT images of adult brains from [www.brainplace.com](http://www.brainplace.com). They show the activity in the brain, not the actual physical brain. The holes are areas of low brain activity and not physical holes in the brain. They are parts of the brain that are no longer working properly. In the healthy brain the activity image looks like the physical shape of the brain because all of the brain material is active.

Studies now have shown that the problems of attention deficit disorder can go on into adulthood; however, adults are usually more capable of controlling behavior and disguising difficulties.

ADD is not usually caused by: too much TV, food allergies, excess sugar, poor home life, or poor schools.

ADD is a worldwide disorder affecting all cultures. It is estimated that about 90% of all people identified as having ADD in the U.S. are prescribed stimulants at some time during treatment. It is almost like among U.S. children the only therapeutic response by doctors is to prescribe stimulants.

Sometimes children abuse ADD treatment drugs. “In order this does not happen in the U.K. we need carefully targeted and monitored interventions and good cooperation between professionals from different disciplines.” – British Psychological Society’s thoughts on how ADD in the U.K. should be handled. My opinion of ADD is the same as the British Psychological Society’s opinion. I think ADD should be carefully treated and monitored. I also think that there should be cooperation between doctors that treat the disease in order to come up with a more effective treatment of ADD and to stay on top of new discoveries in the disorder. This would prevent some doctors from being less educated about the disease and therefore less efficient in diagnosing it than other doctors.

“The report urges restraint in the prescribing of psychostimulants: “It must not be the first, and definitely not the only, line of treatment.”” [www.mentalhealth.com](http://www.mentalhealth.com) This is another very true statement. Sometimes diet and other natural procedures might help an ADD patient. About 5% of children with ADHD are helped by restricted diet.

“Many factors affect the way attention is displayed in particular situations and professionals should be wary of describing children as having ADHD without a thorough investigation of alternative explanations.” The British Psychological Society seems to be very on top of the diagnosis of ADD. I am hoping that my research project will influence doctors to also make sure that they will be very careful in diagnosing ADD, and hopefully bring about thoughts that a US movement in better educating physicians that diagnose ADD should be underway.

Attention deficit disorder has many diverse and conflicting opinions and they have resulted in confusion for families and caregivers. Hopefully my research project will point this out and hopefully in the future doctors in the United States will work together to bring about a set and better way of diagnosing ADD, preventing confusion and conflicting opinions.

There is no cure for ADD.