

ATTENTION DEFICIT HYPERACTIVITY DISORDER: MEDICATIONS  
VERSUS DIETS

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Submitted to  
Northern Michigan University  
In partial fulfillment of the requirements  
For the degree of  
Master Of Arts In Education

Graduate Studies Office

2012

**Abstract**

Many children are diagnosed with Attention Deficit Hyperactivity Disorder annually. Numerous medications are available to treat this disorder, and parents of children with this disorder are becoming more interested in alternatives to medications such as modifying diets as a means of dealing with ADHD. This study analyzed prior research on the varying effects of medication versus diet modification in children suffering from ADHD. These studies show evidence to support diet changes, but these diet changes cannot substitute as a form of treatment at this time. Medications have been shown to be the most widely used and effective form of treatment for ADHD.

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## **Chapter 1: Introduction**

Attention Deficit Hyperactivity Disorder, or ADHD, is a disorder affecting many children in schools. This disorder appears more frequently in boys than in girls (Bellisle, 2004), but there are no explanations for this discrepancy. Medication is the most common treatment for ADHD, but many parents desire an alternative (Goldstein & Ingersoll, 2000). One alternative to medication for the treatment of ADHD is found in altering the child's diet. Nutritional factors such as intake of food additives or colors and refined sugars, as well as food allergies and fatty acid deficiencies, have all been possibly linked to ADHD (Duca, 2010). Nutritional diets eliminate foods with additives and supplement food intake with vitamins or minerals. Diet modification holds considerable appeal for parents of children with ADHD because diets give parents control and the ability to promote a healthy lifestyle for their child (Cormier & Elder, 2007).

Effective treatment of ADHD is becoming increasingly important in schools because children with ADHD exhibit higher average rates of off-task behavior in classroom settings, thereby compromising their performance on independent assignments, in-group discussions, and attending to teacher instruction (DuPaul, Ervin, Hook, & McGoey, 1998). The off-task behaviors observed in classrooms consist of a low attention span, impulsivity, and over disruptive activity. Schools have high standards, and having children in classrooms unable to focus and preventing others from focusing is a problem. The symptoms of ADHD have shown a robust inverse relationship with achievement and problem behaviors have connections to academic underachievement (Barriga, Doran, Newell, Morrison, Barbetti, & Robbins, 2002).

Children with ADHD have behavior problems because of inattention and hyperactivity associated with the disorder (Stevenson, 2010). Studies have been done to show the positive effects diets can have on children with ADHD, and medications and diets both prove to be effective forms of treatment for this disorder, as will be illuminated in Chapter 2.

### **Background**

Attention Deficit Hyperactivity Disorder is characterized by symptoms of inattention, distractibility, overactivity, and impulsivity (Arnold, DiSilvestro, Bozzolo, Crawl, Fernandez, & Joseph, 2011). Studies estimated the prevalence of ADHD symptomology to be as high as 7% -12% of school age children. Approximately 60% - 85% of children diagnosed with ADHD will continue to have symptoms into adolescence (Duca, 2010).

Medications or stimulant drugs are the most common and most studied treatment for childhood ADHD (Castle, Aubert, Verbrugge, Khalid, & Epstein, 2007). Despite modern pharmacological advances, only 30%-70% of children with ADHD respond to these types of interventions (Rucklidge, Johnstone, & Kaplan, 2009).

### **Statement of the Problem**

Learning disabilities such as ADHD are increasing and are drawing concern. Some children who take stimulant medications for the treatment of ADHD experience side effects including insomnia, reduced appetite, mood changes, weight loss, irritability, stomachaches, and headaches (Snider, Busch, & Arrowood, 2003). Many parents are concerned about the side effects of these medications. Children in their preteens who were medicated had stunted growth, as well as an increased risk of juvenile misbehavior

and possibly, substance abuse (Sinn, 2008). Studies suggest families want treatments with fewer side effect or remedies, which might be considered safer than some medications.

Some studies indicate nutritional diets are becoming more prevalent in treating children with Attention Deficit Hyperactivity Disorder (Schnoll, Burshteyn, & Cea-Aravena, 2003). Families are requesting healthy alternatives to medications. Finding out about nutritional diets can help children with ADHD and the families as well. Learning more about nutritional diets will benefit the classrooms where the children learn. By avoiding foods with artificial food colors or additives, increasing a child's iron, and modifying their diet and adding nutrients could have impacts on their ADHD symptoms.

The research focuses on three components of a nutritional diet and the benefits such a diet may have for managing and treating ADHD. These include iron deficiency, artificial food coloring, and diet modification.

Low iron contributes to inattentive, impulsive, and hyperactivity behaviors and low iron may explain as much as 30% of ADHD severity (Konofal, Lecendreux, Arnulf, & Mouren, 2008). In the brain, iron is turned into ferritin and when ferritin or iron levels are low in children, it has been known to affect the development of the central nervous system, leading to mental retardation and behavioral disorders such as ADHD. These findings regarding low iron levels could have a major and immediate impact on the treatment of children with ADHD.

The second area in nutritional diets and the effects on children with ADHD focused on how artificial food colors, or AFC's, affect children with ADHD. The question of the possible role of food additives, and specifically food colors, is increasing in the issue of hyperactive behavior in ADHD children. Research suggests the removal of



food colors from the diet can make improvements in the behavior of some children with ADHD (Stevenson, 2010).

The third area in nutritional diets focused on eliminating or modifying some foods and adding daily nutrients to a child's diet. Carefully supervised food diets in children with ADHD can exhibit substantial changes in behavior (Pelsser, Frankena, Toorman, Savelkoul, Pereira, & Buitelaar, 2009). Children are far better by modifying the diet, using nutrients first, and turning to medications only as a last resort. In a robust study to determine whether an elimination diet can decrease the ADHD symptoms children with ADHD were given an elimination diet and also were monitored during their usual diets for two weeks. In conclusion, the elimination diet led to a statistically significant decrease in symptoms in the young children with ADHD (Duca, 2010).

It is possible nutritional diets could be an alternative to medication when it comes to treating ADHD. Some researchers suggest modifying a child's diet could be a better option than medications (Arnold, 1999).

This study explored the potential benefits of diet modification with nutritional supplementation as an alternative to prescription drug use. The study examined existing research from 1975 to present to determine effectiveness of alternative treatment modalities for ADHD. Research regarding both prescription medication and diet modification were examined to determine treatment efficacy for children with ADHD.

### **Research Questions**

In light of the previously stated issues and concerns, this study poses the following questions:

1. What are some of the reasons medications are not the first choice for some parents?
2. According to the literature, what modifications to a diet are necessary to classify it as nutritional?
3. To what degree is there consensus among researchers to support nutritional diets as an effective form of treatment for ADHD?

### **Definitions of Terms**

1. *Attention Deficit Hyperactivity Disorder*. Classified by the Diagnostic and Statistical Manual of Mental Disorders as a mental disorder primarily characterized by a persistent pattern of inattention and/or hyperactivity-impulsivity that is more frequent and severe than is typically observed in individuals at a comparable level of development (Harding, Judah, & Grant, 2003).
2. *Artificial Food Colors (AFC)*. Additives or preservatives added to many kinds of foods to preserve food to keep from spoiling (Stevenson, 2010).
3. *Academic Underachievement*. Academic performance, which is below normative age, levels rather discrepant from one's general cognitive ability (Barriga, Doran, Newell, Morrison, Barbetti, & Robbins, 2002).
4. *Stimulant Drugs*. Effective prescription drugs primarily named stimulant drugs (Borek, 2000).

## **Chapter 2: Literature Review**

Attention Deficit Hyperactivity Disorder affects many children. Research has been done to support the use of medication as a means of treatment for this disorder. Evidence also suggests diet modification as being a method to help control symptoms associated with ADHD. Both forms of treatment have been researched and show the positive impacts they have on ADHD.

### **History of Attention Deficit Hyperactivity Disorder**

Attention Deficit Hyperactivity Disorder has been investigated extensively over the last 30 years (Goldstein & Ingersoll, 2000). Many fields, including psychology, education, and conventional medicine, have tried to find solutions to this disorder. Clinicians and researchers acknowledge the complex issues related to ADHD and have found most studies to be indifferent. It is certain that different strategies of treatments will work for different people diagnosed with ADHD and researchers are beginning to attempt to identify variables associated with treatment success (Schnoll, Burshteyn, & Cea-Aravena, 2003).

### **Diagnosis of ADHD**

Attention Deficit Hyperactivity Disorder is the diagnostic category in the Diagnostic and Statistical Manual of Mental Disorders, fourth edition or DSM-IV with three main types including hyperactive-impulsive (HI), inattentive (IA), and a combined type. The combined type is the most common and, along with hyperactive-impulsive disorder, is identified more frequently in boys while inattentive disorder (IA) is identified more in girls (Banhatti and Dwivedi, 2009).

A diagnosis of ADHD should not be made unless there is impairment in their learning abilities or social abilities and the impairment is consistent over at least two different social settings. When a child is at the severe end of the spectrum, there is no debate about the need to intervene medically. When diagnosing a child with ADHD it is important to remember the behaviors must be before the child is the age of seven, the behaviors must be persistent for a minimum of six months, and the symptoms must be impairing the ability to cope with school or social demands. The table below helps with diagnosing ADHD (Banhatti & Dwivedi, 2009).

Table 1

*Characteristics of ADHD*

Inattention	Hyperactivity	Impulsivity
Does not attend	Fidgets	Talks excessively
Fails to finish tasks	Leaves seat in class	Blurts out answers
Can't organize	Runs/climbs excessively	Cannot await turn
Avoids sustained effort	Cannot play/work quietly	Interrupts others
Loses things, forgetful	Always 'on the go'	Intrudes on others
Easily distracted	Talks excessively	

*Note.* From Banhatti & Dwivedi, 2009.

**Medication Treatment Modalities**

About half of United States children and adolescents diagnosed with ADHD receive stimulant medications (Scheffler, Hinshaw, Modrek, & Levine, 2007). Stimulant medications or drugs are commonly used to treat symptoms of ADHD and are considered the first-line treatment for ADHD. ADHD is a chronic condition, which requires ongoing management and monitoring. Stimulant medication can be effective in managing the symptoms of ADHD among school-aged children (Brown, et al., 2005). The most common complaint of families who have used stimulant drugs are the side effects associated with the medications (Arnold, 1999).

The treatment study of children with ADHD continues to significantly influence clinical practice, and for many cases, carefully crafted and selected medication remains an important part of treatment. Developments in the pharmacological management of ADHD means there is now a much greater choice of approved medications (Graham, Seth, & Coghill, 2007).

Many forms of medications are available. These forms of medications range from stimulant to nonstimulant, short-acting, immediate release, slow release, and extended release. Medications can be administered orally and some are available in a patch form to wear against the skin.

Currently drug treatment of a child plays a central role in many cases. Some of the most commonly used medications are listed below (Rains and Scahill, 2006):

Stimulants:

- Ritalin
- Concerta
- Equasym
- Equasym XL

Nonstimulants:

- Strattera (Atomoxetine)
- Clonidine
- Guanfacine
- Atomoxetine
- Desipramine

Medications are a common form of treatment for many parents of children with ADHD. Like many medications available, they do have side effects. The side effects of these medications are what deter many parents from administering the medications to their children. Common and uncommon side effects associated with both stimulant and nonstimulant medications are listed below (Rains and Scahill, 2006):

Common Side Effects:

- loss of appetite
- headaches
- fatigue
- nausea
- dizziness
- blurred vision
- sweating
- increased heart rate
- weight loss
- increased blood pressure

Uncommon Side Effects:

- tics
- blood changes
- psychosis
- long term growth suppression
- long term tolerance and addiction

**Diet and ADHD**

Among the best-known dietary interventions, the most widely known and advocated is the Feingold Diet. The Feingold Diet is a food elimination diet which eliminates all artificial food colors, artificial food flavors, and preservatives. It has advocated that children sensitive to a variety of foods and food colorings, including preservatives, may develop symptoms of ADHD as a reaction to these additives. Advocates for diet modifications have made some claims stating that additive free diets will improve most if not all children's learning and attention problems. These advocates describe elimination diet case studies in which children could be removed from their current medication if their diet was maintained. They also report improvements in school for these children and deterioration in learning and behavior when the diet is not followed (Goldstein & Ingersoll, 2000). When evaluating Feingold's claims, case studies were shown to have some positive effects regarding the diet. There were severe dietary restrictions but these studies suggest that there was a small subset of children who demonstrated a dramatic reduction in hyperactive symptoms when following the diet (Schnoll, Burshteyn, & Cea-Aravena, 2003).

**Treatment Alternatives**

Attention Deficit Hyperactivity Disorder has attracted many kinds of proposed treatments. Treatment alternatives can be described as any treatment other than prescription psychoactive drugs or behavioral treatments (Arnold, 1999). Nutritional diets or modifying a child's diet can be considered an alternate treatment.

There is some evidence that eliminating certain foods or altering their diet is beneficial to some children with ADHD. If a child is suspected to be sensitive to some

foods, those foods can be eliminated on a trial basis under the supervision of a doctor or dietician to see if the symptoms of ADHD have been reduced (Tsuchiya, 2006).

Studies suggest having low iron levels, eating foods with artificial food colors or additives, and modifying or eliminating certain foods from a diet can be effective in controlling ADHD symptoms.

### **Iron Deficiency and its Relationship to ADHD**

Iron can be defined as essential for brain growth and deficiency in iron can include decreased attention and responsiveness (Rucklidge, Johnstone, & Kaplan, 2009). Iron deficiency causes abnormal dopaminergic neurotransmission or brain transmissions and may contribute to the physiopathology or mental illness of ADHD (Konofal, Lecendreux, Arnulf, & Mouren, 2008).

Konofal, Lecendreux, Arnulf, and Mouren compared iron levels among children. The study consisted of fifty-three children all aged from 4-14 years old, who met the criteria for ADHD. The participants were randomly picked from a group of 110 children all from the same school district. The severities of the ADHD symptoms were evaluated with Connors' Parent Rating Scale, a scale using various questions to determine a child's inattentive and impulsive behavior. After the evaluation, iron or serum ferritin levels were measured in the morning. Iron levels were compared with ADHD symptoms measured in the Connors' Parent Rating Scale (Konofal, Lecendreux, Arnulf, & Mouren, 2008).

As a result, the children with the most severe iron deficiency were the most inattentive, impulsive, and hyperactive. The Connors' Parent Rating Scale included three sub scores in hyperactivity, oppositional, and cognitive. The cognitive scores correlated



with significantly low iron levels and this may suggest the iron deficient children are mainly inattentive and distractible and suffer from learning disabilities. The correlation between iron deficient children and suffering from learning disabilities is consistent with the role of iron deficiency in cognitive deficits (Konofal, Lecendreux, Arnulf, & Mouren, 2008).

### **Artificial Food Colors**

Artificial food colors or AFC's are linked to increased symptoms of ADHD among children in the general population. Kleinman, Brown, Cutter, DuPaul, and Clydesdale (2011) completed a randomized, double-blinded, placebo-controlled, crossover trial was done to test behavioral effects of artificial food colors on children.

The participants were broken into two groups. The first group consisted of 137 preschoolers, age 3. The second group consisted of 130 school-aged children, ages 8 and 9. Each group of children consumed two different dye mixes, mix A or mix B, or a placebo mix. Mix A consisted of 20 mg of artificial food colors for preschool aged children or 24.98 mg of artificial food colors for school aged children. Mix B contained either 30 mg of artificial food colors for preschool aged children or 62.4 mg of artificial food colors for school-aged children. Both age groups had insignificantly increased hyperactivity scores when challenged with one or both of the dye mixtures compared with the placebo mixture (McCann et al., 2007).

Studies have been performed from various researchers, doctors, and scientists to prove that artificial food colors have no effects on hyperactivity. However, like many issues there is research to support both sides of the controversy.

**Modifying Diets**

Duca (2010) explored the efficacy of an elimination diet with regard to a decrease in ADHD symptoms in a group of young children. Forty children, aged 3-7 years old who met the criteria for having ADHD, followed their usual diet for two weeks. After those two weeks, the children followed an elimination diet, which consisted of only a few foods including rice, turkey, pears, and lettuce. The behaviors were evaluated at the beginning of the study, after the baseline period, and at the end of the diet by the parents. Parents completed a 10-item Connors' List as well as an ADHD Rating Scale, and a physical complaint list. The teachers completed a 10-item Connors' List and the ADHD Rating Scale twice, at the beginning of the diet and at the end of the diet (Duca, 2010).

The study reported the parent ratings showed an improvement of at least 50% on both the Connors' List as well as the ADHD Rating Scale at the end of the elimination diet. Among the 15 children who had both parent and teacher ratings, 10 responded favorably at home and at school. In conclusion, the elimination diet could possibly lead to significant decrease in symptoms in children with ADHD (Duca, 2010). More research would be needed to validate this conclusion that elimination diets could decrease ADHD symptoms in children.

Nutritional diets may be effective in treating ADHD. Artificial food colors should be eliminated from diets, as well as keeping a close eye on the foods a child is consuming can all be examples of nutritional diets, which could be effective in the treatment of ADHD.

**Nutritional Effects**

A proposed nutritional diet to alleviate ADHD symptomology consists of healthy levels of iron and foods with either no or very little amounts of food colors or additives (McCann et al., 2007). Finding foods without food colors or additives can be difficult. Examples of foods with food colors or additives are anything prepackaged on shelves in grocery stores. Foods that would be good choices would be fresh fruits, vegetables, and whole grains.

Transler, Eilander, Mitchell, and Van De Meer (2010) found diets comprised mainly of whole foods and not processed foods would be a way to establish a healthy balance of omega-6 and omega-3 fatty acids. A mix of Omega-6 and Omega-3 fatty acids daily diminishes the frequency of ADHD symptoms. Omega-6 fatty acids are the most common fat consumed in the standard American diet. The problem with high amounts of omega-6 is low amounts of omega-3 fatty acids as well. To have a well balanced diet, both omega-6 and omega-3 fatty acids need to be incorporated into daily food choices. Omega-6 fatty acids can be found in margarine, mayonnaise, salad dressings, snack foods, processed foods, and fast foods. Omega-3 fatty acids can be found in flaxseed, chia seeds, walnuts, and oily fish (Shanti, 2011).

**Reasons Medications are not the First Choice for Some Parents**

There continues to be many questions in need of answers concerning the treatment of ADHD. Although there are many effective treatments available, they may not be equally effective with all children experiencing ADHD symptoms. In their efforts to seek effective treatment, parents are becoming desperate and are being confused by misinformation in the marketplace regarding treatments that are effective yet safe

regarding medications available. Unfortunately, most parents, no matter how intelligent or well educated they are, do not have the training or expertise necessary to evaluate scientific findings regarding medications (Goldstein, 2000).

Studies have shown that both stimulant and nonstimulant medications are effective forms of treatment for children with ADHD (Graham, Seth, & Coghill, 2007). Even though medications are effective forms of treatment these medications also come with various side effects in which parents are not comfortable with for their children. If these medications came without side effects they may be the most widely accepted form of treatment for ADHD (Banhatti and Dwivedi, 2009).

### **Modifications Necessary to Classify a Diet as Nutritional**

The effects of good nutrition on ADHD symptoms have a lot of evidence to support but very little research. Evidence supports that eliminating or reducing the amount of artificial food colors in foods can make it more nutritional and lessen ADHD related behaviors. Another modification to a diet to classify it as nutritional is to limit sugar and increase iron intake. Eating foods high in iron and low in sugar can be healthy choices for students struggling with ADHD. Even though the research in this area is limited, benefits of a healthy diet can help not only in the areas of ADHD but also in other various areas such as childhood obesity (Newmark, 2009).

### **Consensus in Support of Diet as an Effective Treatment for ADHD**

Based on previous studies there does not seem to be enough research to fully support nutritional diets as effective forms of treatment for ADHD. Findings to support nutritional diets are limited. Even though there have been studies completed they are not

conducive to fully classify as a form of treatment on their own. Medications are still the best choice of treatment for ADHD symptoms despite the negative side effects.

### Chapter 3: Results

Research suggests diet modifications, drug interventions, and combination therapy can all be effective in the treatment of ADHD. Table 2 shows various studies completed and the findings. Improvement was most significant in elimination diet tests, and artificial food colorings did seem to have a negative effect on behavior.

Table 2

#### *Effectiveness of Diet Modification*

Author	Year	Study Type	Findings
Feingold	1975	Elimination Diet	50% of hyperactive children who followed the diet responded favorably
Egger, Carter, Graham, Gumley, & Soothill	1985	Elimination Diet	82% showed improved behavior after following the elimination diets
McCann, Barrett, Cooper	2007	Double-blind, placebo controlled study on AFC's and additives	Increased hyperactivity after consuming AFC's and additives
Kaplan, McNicol, Conte, & Moghadam	1989	Elimination Diet with placebo controlled	Over 50% had reliable behavior improvement, no placebo effect
Bateman, Warner, & Hutchinson	2004	Double-blind, placebo controlled	Artificial food colors or preservatives have a substantial and statistically increase in hyperactivity.

Table 3

#### *Effectiveness of Drug Intervention*

Author	Year	Study Type	Findings
The Tourette Syndrome Study Group	2002	Randomized controlled study	All drugs were tolerated and participants showed improvements after 24 weeks
Diamond, Tannock, & Schachar, McBurnett & Weiss	1999	Randomized, open-label 10 week study	Reduction of inattentive and hyperactive-impulsive symptoms
	2009	8 week fixed dose, randomized clinical trial	Improvement in ADHD symptoms
MTA Cooperative Study Group	2009	Randomized controlled study	Groups who received medication showed high levels of improvements

Table 3 shows the studies completed and the results related to the effectiveness of drug intervention in the treatment of ADHD. Positive results were observed in all four studies cited.

Table 4 shows the studies completed to show the effectiveness of combination therapy. Combination Therapy can be described as any combination of medications, diets, or behavioral treatments. In the two cited studies, combination therapy demonstrated both clinical symptomatic improvement and was liked by parents.

Table 4

*Effectiveness of Combination Therapy*

Author	Year	Study Type	Findings
Harding, Judah, & Gant	2003	Randomized controlled	Support the effectiveness of a combined vitamin, mineral, amino acid, probiotic, essential fatty acid, and phospholipid treatment in improving attention and self-control
Multimodal Treatment Study of Children with ADHD	1999	Randomized Clinical Trial	Combination treatment was significantly more effective, showed greater efficacy, and in terms of parent satisfaction, was rated the best

## **Chapter 4: Discussion and Recommendations**

Current research does not suggest that modifying diets are complete treatment alternatives to medications at this time. More research is required to determine if modifying diets will be a healthy and productive form of treatment for children with ADHD.

### **Reasons Medications are Not the First Choice for Some Parents**

Medications are not always the first choice for some parents when they learn of the various side effects that can happen to their children. Most parents in the various studies very clearly stated they wanted healthy alternatives to medications. Putting their children on medications at such a young age was not something many parents wanted to do. When the idea of modifying diets or having an alternate treatment was an option, many parents were willing to participate before going the route of medication. If medications did not come with such negative side effects, it seems as though many parents would not have to make such a hard decision regarding their child's treatment.

### **Modifications Necessary to Classify a Diet as Nutritional**

Modifying a diet can be as simple as taking the processed foods and replacing them with healthier choices such as fruits and vegetables. One underlying issue researched is the issue relating to artificial food colors. Many studies done show the effects artificial food colors have on hyperactivity with children yet studies have been done to show that artificial food colors have no effects on children with hyperactivity. With studies proving both sides to the issue, it is clear that artificial food colors may or may not increase hyperactivity. One diet modification studied and proven to be effective is the increase in a child's iron. Iron has been studied and shown to increase attention and



responsiveness. Eating foods with more iron can be a healthy modification to a diet to make it more nutritional and beneficial to combat some ADHD behaviors. More research is needed to support more modifications to diets as being effective in the treatment of ADHD.

### **Consensus Supporting Nutritional Diets as an Effective Treatment for ADHD**

There does not appear to be enough research available at this time to classify nutritional diets as a form of treatment for ADHD. Many of the research completed seem to have valid points and suggestions for parents to try if they are not interested in using stimulant or nonstimulant medications. Parents need to have more evidence than what is available before making treatment choices for their children.

### **Recommendations**

Most people would agree that, at this time, medications are the only effective form of treatment for the symptoms associated with ADHD. Medications have shown to have various negative side effects associated with them. Many of these side effects can be very alarming to parents. Therefore, it is evident that an alternate treatment is needed to help deal with the symptoms associated with ADHD. Medications with such severe side effects cannot be the only treatment available to children with ADHD.

Studies have suggested that having a more nutritional diet can have positive impacts on a child's attention span as well as their impulsivity and hyperactivity. The following could be some ideas in implementing both at home and at school to help with ADHD symptoms:

- Foods high in iron
- Fresh fruits and vegetables

- Fewer processed and packaged foods-more fresh foods
- Foods high in both Omega-6 and Omega-3 fatty acids including margarine, salad dressings, walnuts, and fish
- Fewer high sugar foods

It is important to note that these changes made to a child's diet need to be consistent in order for them to properly work. The child must be able to obtain nutritious meals in all environments. Therefore, packing healthy lunches if ones are not available at school will need to be done as well as educating the child to understand the importance of healthy choices. If a child is eating unhealthy snacks at school this will in return enhance the ADHD symptoms or behaviors and in the end not properly work as a form of alternate treatment.

### **Areas for Further Research**

More clinical research needs to be completed regarding the efficacy of nutritional diets alone as an effective form of treatment for ADHD symptoms. At this time, there is clear evidence that nutritional diets can help alleviate some symptoms related to children with ADHD, but findings do not suggest that nutritional diets alone can be considered a complete treatment modality. Modifying a child's diet could be used to treat some symptoms of ADHD, but does not warrant classification as a form of treatment for the disorder.

Issues such as the elimination of artificial food colors need more substantial research. Several studies show that artificial food colors are not related to symptoms associated with ADHD, while this is refuted by others. With research supporting both

sides, the existence of artificial colors in food can be confusing to parents wanting to make the best food choices for their children with ADHD symptoms.

Additional studies should also be completed regarding the impact of iron in diets, since there is some indication that increased iron consumption may alleviate ADHD symptoms. Further nutritional research may demonstrate an optimal regimen of combined therapy that lessens the need for prescription drugs but, at this time, nutritional diets alone are not, and should not be, the solely used form of treatment for ADHD.

### **Summary**

With the lack of unambiguous research regarding nutritional diets as a method of treatment for ADHD symptoms, medications will remain the most widely used form of treatment. There is currently no research agreement as to the effectiveness of diet-alone treatment as an efficacious treatment for ADHD. Consequently, medications are and will remain the most commonly used form of treatment for the treatment of ADHD in children.

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