

# ATTENTION DEFICIT AND HYPERACTIVITY DISORDER (ADHD)

BY

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## **Introduction:**

Attention deficit and hyperactivity disorder is one of the most frequently diagnosed disorders in young children and teenagers. Several million children are reported to be treated for ADHD; however, some school classrooms report that as high as 30% of the students are being treated for this illness.

The child is normally diagnosed with ADHD between the ages of six and twelve years of age<sup>1</sup>. The symptoms are usually:

Inattention - Having a shorter than usual attention span and can be easily distracted.

Impulsivity - Not being able to control impulses.

Hyperactivity - Periodic over activity.

The diagnosis of ADHD is made by several methods: medical history and physical exam and/or tests, both verbal and written. It is not uncommon for the diagnosis to be made by the parents and/or educational personnel, such as teachers and school nurses. This is usually the result of close observation and monitoring of the child's behavior and performance<sup>1</sup>.

Many children diagnosed as having ADHD perform poorly in school due to their inability to focus their attention and stay on task. Once diagnosed, treatment can be broad and varied. The present approaches include medication, behavior management, social skills training, counseling, and a holistic approach. Included under the broad category of holistic are biofeedback, homeopathy, diet restriction, herbal medicines, and other natural substances.

Not enough research has been obtained relative to these holistic modalities. One of the modalities, which has been researched and has shown some promise, is food restriction. It appears that both restricting dietary sugar and food chemical additives have helped a limited number of children who have ADHD.

The common treatment in our society for ADHD is usually the drugs Ritalin, chemically named methylphenidate, or to a lesser extent the drug Dexedrine, chemically named dextroamphetamine<sup>3</sup>. Ritalin is said to control the symptoms in 70% of the cases. However, neither medication sustains any healing properties. Unfortunately, both drugs have been shown to have similar side effects on the brain, mind, and behavior including conditions such as psychosis, mania, drug abuse, and addiction. Ritalin can cause permanent neurological tics and also growth retardation in children by disrupting the cycles of growth hormone secretion by the pituitary gland.

Ritalin, when ground up and inhaled, is being used as a recreational drug. It is being obtained illegally with and without a prescription, and reports indicate that it could present a problem of addiction. There is also evidence that occasionally it eventually leads to the use of more serious narcotics.

In this study, I have elected to use natural substances as a treatment for ADHD in children. The substances are essential oils. Essential oils are aromatic, volatile liquids distilled from shrubs, trees, roots, bushes, seeds, and flowers<sup>2</sup>.

The oils, made up of resin and plant extracts, are the most powerful part of the plant<sup>2</sup>. The essential oils are extracted from the plant or tree by various methods. The most effective method is by the process of distillation wherein the plant is heated at specific temperatures, pressures, and time to best separate the oil from the plant structure without fracturing the chemical constituents. Essential oils contain hundreds of different chemical compounds, each having specific properties and actions. When these essential oils are inhaled, they not only provide exquisite fragrances, but they have also proven to

be able to produce physical, emotional, mental, and spiritual well-being of people since the beginning of time<sup>2</sup>. Records dating back to 4500 BC describe the use of balsamic aromatic substances for religious rituals and medical conditions<sup>2</sup>.

The chemical constituents of essential oils have been compared to human blood for they have similar properties; that of immune and nervous system stimulation, being antimicrobial in nature, of containing nutrients and oxygen, and of stimulating the regeneration of all tissues. One of the reasons for this is the way by which the oils are absorbed by the body. When the essential oil is inhaled, the micro droplets are carried to the limbic system of the brain, which is that portion that is the processing center for reason, emotion, and smell, and to the hypothalamus, which is the hormone command center. The essential oil micro droplets are also carried to the lungs where they enter the circulatory system. Some essential oils contain high levels of the chemical constituents sesquiterpenes, which can dramatically increase oxygenation and activity in the brain<sup>2</sup>. Other essential oils because of their unique constituents tend to have a greater role in hormonal secretion and in the balance of mood and emotions.

### **Method:**

**Subjects:** The study was performed with children, ages six to fourteen, who were previously diagnosed as having ADHD. None of them were being treated with medication at the time nor to my knowledge had any of them even taken medication specifically for this disorder.

In the study, there were sixteen controls who received no treatment and eighteen subjects who were treated by one of three essential oils. There were six girls and twelve boys in the treatment group and five girls and eleven boys in the control group. They all lived in the Denver greater metropolitan area and were recruited either through advertisements in local newspapers or by word of mouth. They were not financially or otherwise reimbursed for their participation in the study.

**Equipment:** The equipment used in testing the subjects was a real-time electro-encephalograph (EEG). This measures electrical impulses in the brain by placing small sensors called electrodes on a person's scalp to detect the electrical impulses moving through the brain. The real-time EEG measures all major areas of the brain and gives instant feedback. The instruments used in the study were the J and J-I-330-Beta-Theta and the Neurodata 3000. Although the equipment is manufactured by two different sources, their operation is essentially the same in its measurement of the brain waves.

**Equipment Technique:** While the real-time EEG equipment is capable of measuring all the brain waves, only two parameter types were measured, beta and theta waves.

The beta brain waves, whose frequency is 13-30 cycles per second, reflect those waves that are being produced by the brain when the subject is alert and/or performing a task. For example, if one were mentally performing a test, such as deriving a solution to a mathematical problem, then the brain would be functioning in such a manner as to express a large amount of beta waves.

The theta waves, whose frequency is 4-8 cycles per second, on the other hand reflect the brain in the state of sleep or daydreaming, but awake. Therefore, we would tend to see a large amount of theta waves during these states.

Consequently, if we measured the ratio of beta waves to theta waves, we would then have criteria for knowing if the brain is functioning primarily in a beta state, meaning alertness, or a theta state, indicating lack of focus on the tasks at hand.

Obviously, a beta-theta ratio is a significant tool, which can be used to measure the kind of brain function, which we are interested in knowing. One fact observed regarding the brain waves measured by the real-time EEG is that initially there was a difference between the waves of normal children compared to ADHD children. While brain waves from normal children were high in amounts of beta waves and low in the amounts of theta waves during waking hours, the reverse was true in the

children diagnosed with ADHD. In other words, ADHD children had higher amounts of theta waves as compared to beta waves.

**Experimental Design and Procedures:** When the subjects initially entered the study, they were administered a T.O.V.A. test. The T.O.V.A. interpretation evaluates attention to stimuli in comparison to the norms, thereby measuring the degree of impulsivity, which is one of the symptoms of ADHD. This then detects the possible presence of ADHD.

The results, compared to the normal same-gender, same-age, and average I.Q. group, are reported as standard deviations and standard scores. Each subject was then evaluated on the real-time EEG. Their beta and theta brain waves were measured and their beta-theta ratios recorded.

Next, the subjects were randomly divided into three different groups with six persons per group. For each of the three groups, one of three essential oils was randomly selected. The intent was to administer that oil to the subject.

The first of these oils is *Cedrus atlantica*, common name Cedarwood; chosen because of its high concentration of sesquiterpenes making up 50% of its constituents, which improves oxygenation of the cells of the brain.

The second oil is *Vetiveria zizanioides*, common name Vetiver, whose action calms and balances the nervous system and at the same time stimulates the circulatory system.

The third oil is *Lavandula angustifolia*, common name Lavender, which has both a sedative as well as a stimulating action. It sedates part of the brain at the same time stimulating the limbic region of the brain.

Each subject in the study was given a glass bottle of the appropriate essential oil to administer at home.

#### **Treatment:**

Six subjects were given Cedarwood oil, six were given Vetiver oil, and six were given Lavender oil. The subjects were asked to inhale the oil three times a day, using a technique of holding the open bottle next to the nostrils and taking three deep inhalations. The essential oil was inhaled daily for a period of thirty days. At the end of thirty days, the subjects were asked to return to the clinic where they retested on the real-time EEG. The beta-theta ratios were again recorded. Last, they were once again administered the T.O.V.A. test.

#### **Results:**

**Overview of Analysis Procedure:** For each essential oil, the initial beta-theta ratios were compared with the post-treatment tests. The mean scores were compared.

Next, the control data was compared in order to find any change from the first to the second real-time EEG.

The next test was the comparison of the overall T.O.V.A. test scores, both pre-treatment and post-treatment. Then the controls were compared for any change from first to second T.O.V.A. test.

The last comparison was between the pre-testing and post-testing changes of the treated groups compared to pre-testing and post-testing of subjects who were not treated, or controls.

**Treatment Outcome:** The final numbers of subjects in the study shrank from thirty-four at the beginning of the study to thirty at the end of the study. Four of the treated group dropped out of the study, leaving the totals of each of the three groups of four subjects in the Vetiver group, four subjects in the Lavender group, and no change (maintained at six) in the Cedarwood group.

The reasons for the non-compliance were varied from one subject who developed a skin rash to another subject who moved out of the state during the study.

The analyses revealed a significant improvement in the pre- and post-treatment Vetiver essential oil group. The improvement was 32%. A similar result was seen with the pre- and post-

treatment of the Cedarwood essential oil group. The Lavender treated group showed no improvement between pre- and post-treatment testing. When compared with the control group, the Vetiver treated group's improvement was statistically significant.

However, because of the relatively small sample and the extremely low-test scores in the pre-treated real-time EEG study of the Cedarwood group, the statistical analysis was skewed. What this means is that the results showing the improvement was not statistically significant when analyzed. This was true even though the improvement of the test results of pre-treatment compared to post-treatment subjects was quite notable in a positive way. The T.O.V.A. pre- and post-testing results revealed an overall improvement, indicating a reduction of the symptoms of ADHD. The data is provided in the following tables:

TABLE 1

Variable	N	Mean	Std. Dev.	Minimum	Maximum
<b>Treatment = Cedarwood</b>					
PRE	6	52.1666667	10.4578519	39.0000000	66.0000000
POST	6	84.8333333	18.5193592	56.0000000	100.0000000
Change	6	32.6666667	19.6943308	12.0000000	60.0000000
<b>Treatment = Lavender</b>					
PRE	4	80.7500000	18.2460041	64.0000000	98.0000000
POST	4	85.5000000	9.0369611	77.0000000	96.0000000
Change	4	4.7500000	22.3662692	-21.0000000	30.0000000
<b>Treatment = Vetiver</b>					
PRE	4	66.7500000	12.6852933	54.0000000	84.0000000
POST	4	98.7500000	1.5000000	97.0000000	100.0000000
Change	4	32.0000000	13.2916014	14.0000000	46.0000000
<b>Treatment = zControl</b>					
PRE	16	61.8750000	16.6448190	38.0000000	92.0000000
POST	16	76.0000000	15.9874951	32.0000000	99.0000000
Change	16	14.1250000	17.5911910	-15.0000000	49.0000000

*Statistical data compiled by Dennis Eggett, Ph.D., Dept. of Statistics, Center For Statistical Research, Brigham Young University.*

TABLE 2

<b>CONTROL</b>				
<b>95% Confidence</b>				
	Mean	Interval	Std. Dev.	N
Mean T.O.V.A. Pre-Test Score	63.0%	55.0%, 70.9%	18.2%	20
Mean T.O.V.A. Post-Test Score	75.1%	67.6%, 82.5%	17.0%	20
Mean Change in T.O.V.A. Score	12.1%	4.8%, 19.4%	16.6%	20
<b>TREATMENT</b>				
<b>95% Confidence</b>				
	Mean	Interval	Std. Dev.	N
Mean T.O.V.A. Pre-Test Score	64.9%	56.2%, 73.5%	17.1%	15
Mean T.O.V.A. Post-Test Score	89.5%	82.7%, 96.4%	13.5%	15
Mean Change in T.O.V.A. Score	24.7%	14.0%, 35.4%	21.1%	15

## **Discussion:**

This study examined the effectiveness of essential oils in the treatment of ADHD diagnosed children from the ages of six to fourteen years.

Treatment outcome results reveal that the essential oil of Vetiver improves the brain activity and reduces the symptoms in ADHD diagnosed subjects. Similar results were found with the essential oil Cedarwood, although not statistically significant. This lack of significance could be the result of the relatively small number of subjects in this study. The Lavender group showed no apparent improvement after the treatment program.

The improvement of the subjects who were treated with the Vetiver and Cedarwood would have been greater had they not been compared to the change of the control group after their second testing was performed. Note that in Table 1, the control group had some improvement with regards to the beta-theta brain wave ratio. The control group, however, showed a lesser improvement than did the treatment group. This overall improvement in both groups obviously reflects the ability for the subjects to learn the function of the real-time EEG, thereby improving their brain wave response the second time that they were connected to the equipment. In spite of this minor improvement in the control group, which represented learned familiarity, when statistically analyzed and compared to the improvement of the subjects who were treated with the essential oils, certainly in the case of Vetiver, the subjects scored much better in their post-testing versus pre-testing.

In addition, I received several letters from parents of the ADHD children stating that their behavior at home had improved for the better. In several cases, they also stated that school educators informed them that their performance was observed to improve in the classroom. The report cards in some of the subjects had reflected this improvement as well. Since these results were not included in the design of the study, they will not be included here, but is only mentioned as an unexpected improvement in the treated ADHD diagnosed children.

In summary, based on this study, I would not hesitate to recommend the use of the essential oil Vetiver in the treatment of children diagnosed as having ADHD. I would even consider using the essential oil Cedarwood in situations where Vetiver was not available or other cases in which Vetiver was not appropriate.

Certainly, the essential oil Vetiver proved to be the treatment of choice between the three different oils used in this study.

## References

1. Diagnosis of attention-deficit/hyperactivity disorder: Summary (August 1999). Technical Review: Number 3 (AHCPR Publication No. 99-0049). Rockville, MD: Agency for Health Care Policy and Research. Also available: <http://www.ahcpr.gov/clinic/adhdsutr.htm> (accessed: August 26, 2000).
2. Essential oils desk reference compiled by Essential Science Publishing. Second Edition. 2001.
3. Elia, J., et al. (1999). Treatment of attention-deficit-hyperactivity disorder. New England Journal of Medicine, 340(10): 780-788.