

## CASE REPORT

# THE EFFECT OF AVASIN THERAPY ON COGNITIVE, EXECUTIVE, AND ATTENTION FUNCTIONS IN ADHD CHILDREN: A CASE SERIES

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### ABSTRACT

Attention Deficit Hyperactivity Disorder (ADHD) is a neurobehavioral disorder that most commonly occurs in children. The number of ADHD events is getting more increase. Its handling takes a long time so that the use of Complementary Alternative Medicine (CAM) is increasingly in demand. CAM is used by 60-65% of parents with ADHD children to improve symptoms and reduce side effect of conventional medication. Avasin therapy is one the complementary treatments that we used to treat ADHD children.

We conducted avasin therapy to 3 children with ADHD. Before and after avasin therapy, the three children were examined by Children's Color Trail Test to access cognitive function, BRIEF 2<sup>nd</sup> to access executive function, as well as TOVA and QEEG Brain Mapping to assess attention function.

The changes in values on Children's Color Trail Test, BRIEF 2<sup>nd</sup>, TOVA, and QEEG Brain Mapping were obtained after a series of avasin therapy.

**Keywords:** ADHD, avasin, cognitive function, executive function, attention function.

### INTRODUCTION

Attention Deficit and Hyperactivity Disorder (ADHD) is a neurobehavior disorder characterized by symptoms of inattention, impulsivity, and hyperactivity.<sup>1</sup> It often causes disruption of daily activities, inhibition of achievement in children, and increased risk of accidents.<sup>2</sup> Impact of ADHD is not only felt by the child, but is also by the family. The impact on the family is causing stress and depression, disturbed family harmony, and changing work status.<sup>3,4</sup>

The number of events is getting more increase. Its prevalence is estimated to be 5.9-7.1% in childhood and adolescence, and 5% in adults.<sup>5</sup> One report claimed a total of 3 million children with ADHD in the United States.<sup>6</sup> Attention Deficit Hyperactivity Disorder (ADHD) in Indonesia is quite high in number, reached 26.4%.<sup>7</sup> Based on data from The Indonesian National Statistics Agency, the prevalence of ADHD children in 2007 was 8.2 million.<sup>8</sup>

We got some study papers about nonpharmacological

treatment on ADHD. A review of the evidence suggests that with modification, parenting interventions are beneficial for a number of outcomes other than ADHD symptom reduction. Improving the parent-child relationship may have indirect benefits for disruptive behavior.<sup>9</sup> Training in neurofeedback (NF) reduces the symptomatology associated with ADHD.<sup>10</sup> Primary analyses indicate that the physical activity (PA) intervention was more effective than the sedentary classroom-based (SC) intervention at reducing inattention and moodiness in the home context.<sup>11</sup> Acupuncture is an effective and safe therapy in treating ADHD, combined administration of acupuncture and pharmacotherapy or behavioral therapy is more effective than the pharmacotherapy or behavioral therapy alone.<sup>12</sup>

Avasin therapy is one of the complementary treatments that we used to treat ADHD children. Avasin therapy (Awasin Al-Kayy), originated from Middle East, is a medical neuroanatomy-based therapy. Its therapy uses a pressure on certain points of the body using tools made of special metal rods. This method can reduce pain, relax

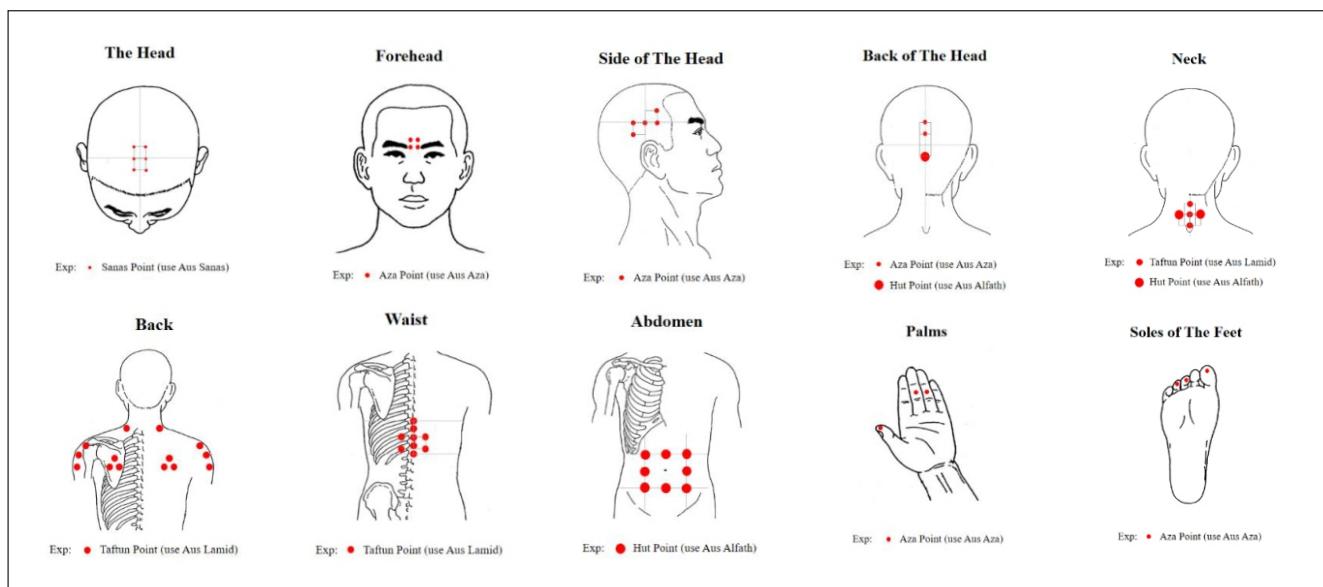
muscles, suppress degeneration processes, improve nerve cell function, enhance immunity, relieve inflammatory processes, and so on. In general, its pressure techniques improve the function of the cell/organ/organ system by stimulating or inhibiting their functions.<sup>13,14</sup>

The principle of *Awasin Al-Kayy* is the delivery of pressure (mechanical stress) from the metal rod (*aus*) to the target organ, through bioelectric conduction of the body. Pressure of the metal rods (*aus*) on the body surface can deliver bioelectric waves to the target organ in accordance with the intended purpose, for example to stimulate the function of certain organs/organ systems, or inhibit the function of overworked body organs.<sup>13</sup>

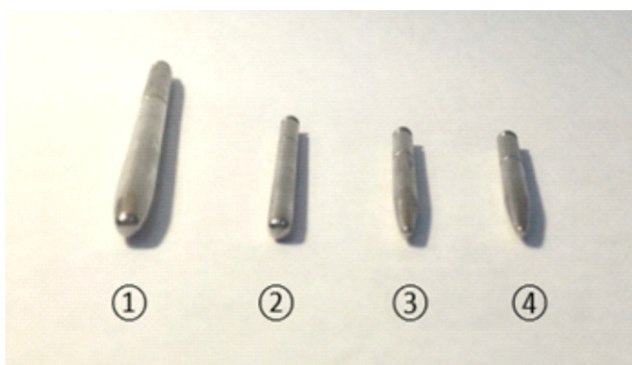
Awasin therapy is expected to be able to have an effect on improving the function of neurotransmitters (dopamine, noradrenaline, serotonin) that play a major role in the pathophysiology and ADHD therapy.

In this research, the pressure are carried out at the points mentioned above which are projections of the organs that play a role in the formation of cognitive, executive and attention processes. These organs, namely the frontal lobe, parietal, basal ganglia, brain stem, and several other body parts which in awasin science have a relationship with brain function, especially to optimize the performance of neurotransmitters in ADHD children.

Awasin therapy, in this research, uses the *Kif* technique (stopping with short intervals) which has the strength of the threshold for 2-5 seconds at *ta'* points on the head, forehead, side of the head, back of the head, neck, back, waist, abdomen, palms, and soles of the feet, using *Aus Alfath and Aus Twelve Lamid, Aza, and Sanas*.



**Picture 1.** *Ta'* points on the head, forehead, side of the head, back of the head, neck, back, waist, abdomen, palms, and soles of the feet.



**Picture 2.** (1) *Aus Alfath*; (2) *Twelve Aus, Lamid* type; (3) *Twelve Aus, Aza* type; (4) *Twelve Aus, Sanas* type.

The tools that used in this research are Children's Color Trails Test to access cognitive function, BRIEF 2<sup>nd</sup> to access executive function, as well as TOVA and QEEG Brain Mapping to assess attention function.

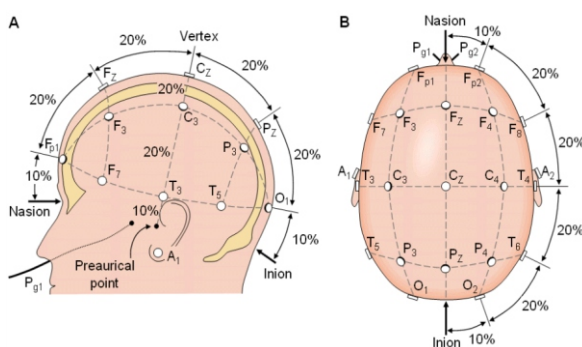
Trail Making Test is a popular neuropsychological instrument used as a screening tool to detect neurological diseases and neuropsychological disorders. The test is believed to measure cognitive function in the frontal lobe, mental flexibility and motor visual ability. Part A is generally considered a test of visual search and motor speed skills, while part B which is more difficult is also considered a test of high cognitive skills such as mental flexibility. Part B can also be a measure of executive control through its correlation with other executive function tests, which show a measure of cognitive flexibility. Age, education and occupation will

influence the value of the Trail Making Test.<sup>15,16</sup> The test is conducted for people aged 15 years old and more. Whereas for children aged 9-14 years old, cognitive function tests are performed with the Children's Color Trails Test. The test is similar to the Trail Making Test for teenager aged 15 years old and adults, but less stimulus on the test.

BRIEF 2<sup>nd</sup> is a standard method for asking several assessors about executive functions in daily life in a way that is not specific to certain disorders, so that it can be used to assess executive function behavior in children and adolescents who experience various difficulties, such as those related to learning, attention, brain injury, developmental disorders, and various psychiatric disorders. BRIEF 2<sup>nd</sup> is most often used to assess ADHD.<sup>17</sup>

TOVA is a computer-based examination that can help to detect, diagnose, and monitor the effectiveness of therapy in attention disorders. TOVA becomes an objective measurement tool for one's attention, not just a subjective assessment of interviews or behavioral observations. TOVA measures a person's ability to respond to visual or auditory stimuli and is recorded with a specially designed and very accurate microswitch ( $\pm 1$  ms).<sup>18</sup>

The function of QEEG Brain Mapping is to record brain waves over a period of time, analyze data from the results of the recording, and display the results in various shapes as needed. For example in the form of topographic images, diagrams, or pictures that show the activity on the outside of the cortex. Someone with ADHD tends to have excessive slow waves (usually theta waves). If this increase occurs in certain parts, especially the frontal lobe, it will be difficult to control concentration, behavior, and emotions.<sup>1,19,20</sup> In this research, the ratio of theta/beta waves in ADHD children are compared between pre-test and post-test. Leads used in this calculation are leads in frontal (F3, Fz, F4), central (C3, Cz, C4), and parietal (P3, Pz, P4). Recording is done in 3 conditions, namely eyes open, talking, and drawing.



Picture 3. Electrode placement on EEG examination with a 10-20 system (Quoted Malmivuo, Plonsey)

Children's Color Trail Test score shows the speed at which the question was processed. The smaller the score obtained means the faster the problem is processed, indicating the better the cognitive function is. BRIEF 2<sup>nd</sup> score shows the severity of the executive function disorder. The higher the score obtained, the more severe the executive function disorder is. TOVA measures the speed and accuracy of the response. The shorter the time required, the higher the TOVA score, indicating the better the attention function is. QEEG Brain Mapping analyzes the ratio of theta to beta waves. The greater the theta/beta ratio, the more impaired the attention function is.

We used avasin therapy to treat 3 children with ADHD. Three ADHD children were examined at the Talenta Center and Islamic Green School Bekasi from August to October 2018. This examination was carried out using Children's Color Trail Test to access cognitive function, BRIEF 2<sup>nd</sup> to access executive function, as well as TOVA and QEEG Brain Mapping to assess attention function, before and after 12 sessions of avasin therapy (in six weeks).

### CASE 1

A 9-year-old child was diagnosed with ADHD when his parents took him to a hospital in West Bekasi in 2016 (age 7) because of hyperactive complaints. He was given methylphenidate for 6 months. According to his parents, after the child took medication, complaints of hyperactivity reduced, but appeared again 1-2 hours later. The medication was not given regularly because his parents felt its response is not good for their child. The parents also tried to conduct behavioral therapy for their child in the growth and development clinic for approximately 6 months, but the therapy was not routinely carried out because there was a mismatch with therapist. At present, hyperactive complaints in the child still arise, especially when attending the class, he still often ran around and refuse to sit on the bench so he could not follow the lesson properly. His parents wanted to treat ADHD symptoms in their child with avasin therapy.

After avasin therapy for 12 sessions (6 weeks), we obtained the results as shown in Table 1 (Children's Color Trails Test), Table 2 (BRIEF 2<sup>nd</sup>), Table 3 (TOVA), and Table 4 (QEEG Brain Mapping).

Table 1. Percentage of value change in Children's Color Trails Test analysis.

	Pre Test	Post Test	%
CCTT Part A	72 seconds	64 seconds	11.1
CCTT Part B	81 seconds	66 seconds	18.5

**Table 2. Percentage of value change in BRIEF 2<sup>nd</sup> analysis.**

	Pre Test	Post Test	%
BRIEF 2 <sup>nd</sup>	149	128	14.1

**Table 3. Percentage of value change in TOVA analysis.**

	Pre Test	Post Test	%
TOVA	-7.78	-3.99	48.7

**Table 4. Percentage of value change in QEEG Brain Mapping analysis.**

	Pre Test	Post Test	%
QEEG ( <i>eyes open</i> )	2.763	1.873	32,2
QEEG ( <i>talking</i> )	4.260	2.537	40,5
QEEG ( <i>drawing</i> )	4.395	3.031	31

**CASE 2**

A 8-year-old child experienced delays in speaking at the age of 2 years old, so his parents consulted to a psychologist. When the child was 3 years old, he was diagnosed with ADHD by a neurologist and given the methylphenidate. Until now, the child is still consuming drugs regularly. According to his parents, after the child took medicine, his emotions became more easily controlled. However, difficulties of being able to focus when doing something still exist, especially when in class, so he is not able to follow the lessons properly. His parents wanted to treat ADHD symptoms in their child with avasin therapy.

After avasin therapy for 12 sessions (6 weeks), we obtained the results as shown in Table 5 (Children's Color Trails Test), Table 6 (BRIEF 2<sup>nd</sup>), Table 7 (TOVA), and Table 8 (QEEG Brain Mapping).

**Table 5. Percentage of value change in Children's Color Trails Test analysis.**

	Pre Test	Post Test	%
CCTT Part A	65 seconds	32 seconds	50.8
CCTT Part B	52 seconds	53 seconds	-1.9

**Table 6. Percentage of value change in BRIEF 2<sup>nd</sup> analysis.**

	Pre Test	Post Test	%
BRIEF 2 <sup>nd</sup>	143	118	17.5

**Table 7. Percentage of value change in TOVA analysis.**

	Pre Test	Post Test	%
TOVA	-1.18	-0.95	19.5

**Table 8. Percentage of value change in QEEG Brain Mapping analysis.**

	Pre Test	Post Test	%
QEEG ( <i>eyes open</i> )	5.014	3.505	30.1
QEEG ( <i>talking</i> )	3.792	3.834	-4.2
QEEG ( <i>drawing</i> )	4.711	3.721	21

**CASE 3**

A 7-year-old child was taken for treatment by his parents to a hospital in East Bekasi when he was 5-6 years old, due to hyperactive complaints. Subsequent examinations were moved to a hospital in West Bekasi, where he was diagnosed with ADHD and given the methylphenidate. Medicines were consumed regularly and had a pretty good effect on the child so he was being calmer than before. However, the child still experience difficulties when attending lessons at school because he could not concentrate (unable to sit still and his emotions were still very unstable). His parents wanted to treat ADHD symptoms in their child with avasin therapy

After avasin therapy for 12 sessions (6 weeks), we obtained the results as shown in Table 9 (Children's Color Trails Test), Table 10 (BRIEF 2<sup>nd</sup>), Table 11 (TOVA), and Table 12 (QEEG Brain Mapping).

**Table 9. Percentage of value change in Children's Color Trails Test analysis.**

	Pre Test	Post Test	%
CCTT Part A	99 seconds	42 seconds	57.6
CCTT Part B	129 seconds	108 seconds	16.3

**Table 10. Percentage of value change in BRIEF 2<sup>nd</sup> analysis.**

	Pre Test	Post Test	%
BRIEF 2 <sup>nd</sup>	154	145	12.3

**Table 11. Percentage of value change in TOVA analysis.**

	Pre Test	Post Test	%
TOVA	-5.12	-6.3	-23

**Table 12. Percentage of value change in QEEG Brain Mapping analysis.**

	Pre Test	Post Test	%
QEEG ( <i>eyes open</i> )	6.245	7.386	-18.3
QEEG ( <i>talking</i> )	8.909	5.950	33.2
QEEG ( <i>drawing</i> )	13.66	5.642	58.7

## RESULT AND DISCUSSION

In the first patient, there was an increase in the working speed of Children's Color Trails Test Part A by 11.1% and Part B by 18.5%, which indicates a better cognitive function. While in the BRIEF 2<sup>nd</sup> analysis, the score decreased by 14.1%, which indicates a better executive function is. Then in the TOVA analysis, there was an increase in the score of 48.7%, which indicates a better attention function. Furthermore, in the QEEG Brain Mapping analysis, there was a decrease in the theta/beta wave ratio in eyes open by 32.2%, talking 40.5%, and drawing 31%, which indicates a better attention function.

In the second patient, there was an increase in the working speed of Children's Color Trails Test Part A by 50.8%, which indicates a better cognitive function, but there was a decrease in Part B by 1.9%. While in the BRIEF 2<sup>nd</sup> analysis, the score decreased by 17.5%, which indicates a better executive function. Then in the TOVA analysis, there was an increase in the score of 19.5%, which indicates a better attention function. Furthermore, in the QEEG Brain Mapping analysis, there was a decrease in the theta/beta wave ratio in eyes open by 30.1% and drawing 21%, which indicates a better attention function, but there was an increase in the theta/beta wave ratio in talking by 4.2%.

In the third patient, there was an increase in the working speed of Children's Color Trails Test Part A by 57.6% and Part B by 16.3%, which indicates a better cognitive function. While in the BRIEF 2<sup>nd</sup> analysis, the score decreased by 12.3%, which indicates a better executive function. Then in the TOVA analysis, the score decreased by 23%. Furthermore, in the QEEG Brain Mapping analysis, there was a decrease in the theta/beta wave ratio in talking by 33.2% and a drawing of 58.7%, which indicates the better attention function, but there was an increase in the theta/beta wave ratio in eyes open by 18.3%.

In conclusion, after avasin therapy was conducted to three ADHD children, the changes were found in Children's Color Trails Test, BRIEF 2<sup>nd</sup>, TOVA, and QEEG Brain Mapping values. It would be necessary to conduct a research with more adequate number of sample to obtain a statistically significant result.

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