

# C E R T I F I C A T E

This is to certify that Dibyendu Bandopadhyay is submitting this Literary research titled "CONCEPT OF ADHD ACCORDING TO INDIAN SCRIPTURES" and Experimental research titled "EFFECT OF YOGA ON ADHD CHILDREN." in partial fulfilment of the requirement for the Master of Science (Yoga and Education) registered with effect from February 1st, 2010 by the Swami Vivekananda Yoga Anusandhana Samsthana under the division Life sciences and is a record of the work carried out by him in this institute.

(Guide)

Dr.Balaram Pradhan

Date:

Place:

# DECLARATION

I, hereby declare that this study was conducted by me at Swami Vivekananda Yoga Anusandhana Samsthana (SVYASA), Bangalore, under the guidance of Dr.Balaram Pradhan and Swami Vivekananda Yoga University, Bangalore.

I also declare that the subject matter of my dissertation entitled below has not previously formed the basis of the award of any degree, diploma, associate ship, fellowship or similar titles.

PART – I

CONCEPT OF UNMADA ACCORDING TO INDIAN SCRIPTURES

PART – II

EFFECT OF YOGA ON ADHD CHILDREN

Place: Bangalore

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Date:

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## ACKNOWLEDGEMENT

To all of my teachers who have sparked my curiosity and imagination, and have nurtured and guided me throughout all the twists and turns of my journey:

I express my profound gratitude to my guides, Dr. Balaram Pradhan and for their encouragement and guidance. Their contribution in my development cannot be expressed in words.

I thank all the members of the faculty, assistant Registrar Dr. Sudhirdesh Panday and my friend Sravan, Kuntal and other all friends for their moral support. I acknowledge with thanks to two Institution authorities who greatly helped me during my experimental sessions. Also I would like to thank all the students who participated in my research as subjects.

I am indebted to my guru, parents for their love and support.

I am also very grateful to Piyali for her help and support.

Finally I thank that the Divine (Lord Krishna) without whose wish, this work wouldn't have been possible.

Bangalore

Date:

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## ABSTRACT

**Objective:** This pre and post with control design evaluated the effect of yoga add on attention and ADHD symptoms.

**Methods:** There were 63 ADHD children in the age range of 6 to 14 years. Potential participants were assessed pre and post intervention on ADHD Rating Scales and Six Letter Cancellation Test. (SLCT) Yoga training was given by a yoga teacher for 1 hour, 4 days in a week for 4 months and consisted of Suryanamaskar, Nadisuddhi and Bhramari with Special Education. The control group were practiced only special education (Behavior modification, Counseling) for equal duration of time.

**Results:** SLCT and ADHD Symptoms Rating Score showed significant improvement in SLCT score and ADHD score in Yoga group. Whereas Control group showed decrease in SLCT. Yoga group found significantly differ from control group.

**Conclusions:** Add on Yoga program has positive impact on attention and ADHD Symptoms.

## CHAPTER -1

### INTRODUCTION

Psychiatric disorders are the most prevalent problems of modern living, with drugs for the management of these disorders selling in billions of dollars every year around the world. It is estimated that about 50 million people have either moderate or severe forms of psychiatric disorders in India (Barua, 2009).

Attention-deficit/hyperactivity disorder [ADHD] is a neuropsychiatric disorder characterized by inattention, hyperactivity and impulsivity that affects from 3-5% of school-aged children. In some cases it may persist into adulthood. Prominent theories about ADHD suggest that inattention, hyperactivity and impulsivity may be due to underlying deficits of the components of attention, including alerting, orienting and executive control (Zorcec, Pop-Jordanova, 2010). Across adults and children, inattention appears to be the most developmentally stable symptomatology of ADHD (Depue, Burgess, Willcutt, Bidwell, Ruzic, & Banich, 2010).

Attention Deficit Hyperactivity disorder (ADHD) refers to a type of psychological disorder of the childhood often visible in the early years behavioral of schooling. It has been found to be caused by the biological reasons mainly associated with deficiencies and dysfunctions of brain generating a lack of ability in exercising self control for making one the victim of three major problems namely inattention, hyperactivity and impulsivity chronic enough for causing serious difficulties in one or more major life areas, home, school, work or social relationships.

Yoga is another method for the management of psychiatric disorders. A recent book, written by a dedicated Kundalini Yoga teacher and an avid researcher, has a wealth of information about psychiatric disorders, especially those with multiple problems (Shannahoff-Khalsa, 2010). An earlier book by the same author deals with specific psychiatric disorders including obsessive-compulsive disorder, acute stress disorder, PTSD, ADD/ADHD and other psychiatric problems (Shannahoff-Khalsa, 2006)

Indian Yoga Research Institutes to look into this alternative closely and provide an integrated approach to many psychiatric problems. There are a few articles by Indian researchers on the

effect of Yoga on psychiatric disorders (Duraismamy, Thirthalli, Nagendra, & Gangadha, 2007; Raghuraj, Nagarathna, Saraswathi, Nunn, & Telles, 2000)

However, more work is needed to move this from the experimental to a clinic setting.

#### Benefits of yoga on children

The adolescents with inflammatory bowel disease were participated in a randomised study on yoga intervention found improvement in functional disability, emotion-focused avoidance, anxiety, and gastrointestinal symptoms (Kuttner, Chambers, Hardial, Israel, Jacobson, & Evans, 2007). Similarly, yoga group found significant reduction in body dissatisfaction and drive for thinness score in eating disorder children (Scime, Cook-Cottone, Kane, & Watson, 2006). Another study showed the beneficial effects of yoga on spatial memory scores in comparison with a fine-arts control group (Manjunath, & Telles, 2004)

Hence based on above studies we planned to evaluate effect of yoga on ADHD children in attention test.

## **CHAPTER- 2**

### **INTRODUCTION**

Attention is a vital part of our life. Because, the ultimate goal of our life is to merge with Paramatma (Moksha). To reach the state of Moksha concentration and attention is very important. Nothing is possible without attention. The disorders related with attention deficiency are vary to the modern science but about this science the age old scriptures deal in a very different manner acting on the root cause of the problem the mind where as modern science deals with the malfunctioning of the nerves and the remedy in accordance doesn't act on the root cause in fact causing side effects. The work which is being presented now is to bridge the gap between the ancient knowledge and the modern science.



## **ADHD IN MODERN SCIENCE**

- In 1854 Heinrich Hoff has described a syndrome related with Attention disorder. It has been known with various names like Attention deficit disorder, minimal brain dysfunction (MBD), hyperkinetic syndrome, Strauss syndrome, organic driveness and minimal brain damage.
- Attention deficit disorder is of four clinical types: with hyperactivity, without hyperactivity, residual type, and with conduct disorder.
- Attention deficit disorder with hyperactivity is abbreviated as ADHD.

### **Clinical characteristics of ADHD**

- Poor attention span with distractibility – Fails to complete the tasks started, Shifts from one uncompleted task to the other, poor listening capacity, easily distracted and often loses things.
- Hyperactivity – Fidgety, Difficulty in sitting in one place, moves here and there, excess talking and interference in others tasks.
- Impulsivity – Acts before thinking, Difficulty in waiting for turn at work.

### **Treatments according to modern science**

- Pharmacotherapy
  - (1) Stimulant medication – Dextro – amphetamine (10-40 mg/day) and methylphenidate (10-60 mg/day) are the drugs of choice in treatment of hyperkinetic disorder, with a response rate of nearly 90%. They act on reticularactivating system causing stimulation of inhibitory influences on the cerebral cortex, thus decreasing hyperactivity.
  - (2) Others – when stimulant medication is not available or it is not effective, other drugs can be used. These include clodine, imipramine, bupropion, venlafaxine, chlorpromazine, thioridazine and lithium carbonate

Behavior therapy – This is a two way approach where one side constitutes of encouraging all the positive behaviors like rewards, shaping, modeling, prompting Etc and the second side constitutes of discouraging negative behaviors like extinction, restraint, reducing anxiety etc.

Here patience plays a major role in the therapist.

- Counseling and Supportive psychotherapy – these two are done personally with the patient which helps in boosting the treatment with drugs.

## According to Ayurveda the Diagnosis of Psychoses

MADHAVANANDA (Chapter Twenty)

The Diagnosis of Psychoses

The definition of Unmāda (उन्माद) according Ayurveda:

मदयन्त्युद्गता दोषा यस्मादुन्मार्गमाग। मानसोयमतो व्यादीरुन्माद इति कीर्तितः। (S.S. VI. 62.3)

*(madayantyyudgatā doṣā yasmādunmārgamāgatāḥ| mānasooyamato vyādīrunmāda iti kīrtitah)|*

As the aggravated humors, affecting the upper part of the body channels (carrying on the mental functions) produce symptoms as in intoxication, this mental disease is known as Unmāda or psychoses.

Types of Unmāda:

एकैकशः सर्वशश्च दोषैरत्यर्थमूर्च्छितैः। मानसेन च धुःखेन स च पंचविधो मतः। विषाद्भवति षष्टश्च यथास्वं तत्र भेषजम्।(S.S. VI. 62.4,5/1)

*ekaikaśaḥ sarvaśaśca doṣairatyarthamūrcchitaiḥ| mānasena ca dhuḥkhena sa ca pañcavidho mataḥ| viṣādbhavati ṣaṣṭaśca yathāsvaṁ tatra bheṣajam)*

Five types of this (Unmāda or psychoses) are due to the excessive vitiation of the three humours separately, simultaneous vitiation of all of them and (the fifth one predominantly due to) grief, while the sixth one is caused by poisons; the treatment should therefore be according to the causative factors.

स चाप्रवृद्धस्तरुणो मदसंज्ञां बिभर्ति च। (S.S. VI. 62.5/2)

(*sa cāpravruddhastaruṇo madasamznām bibharti ca*)

However, in the initial stage when the disease is not advanced it is called mada.

### Unmāda according to Charak saṁhitā

विरुद्धदुष्टाशुचिभोजनानि प्रधर्षणं देवगुरुद्विजानाम्।

उन्मादहेतुर्भयहर्षपूर्वो मनोभिधातो विषमाश्च चेष्टाः॥ (C.S. VI. 9.4)

(*viruddhaduṣṭāśucibhojanāni pradharṣaṇam devagurudvijānām |  
unmādaheturbhayaharṣapūrvo manobhidhāto viṣamāśca ceṣṭāḥ |*)

Eating incompatible, contaminated and unhygienic food, insulting gods, teachers and Brahmins and mental trauma due to(excessive) fear or happiness or else due to unnatural activities are the (general) aetiological factors of psychoses,

तैरल्पसत्वस्य मलाः प्रदुष्टा बुद्धेर्निवासं हृदयं प्रदूष्य।

स्त्रोतांस्यधिष्ठाय मनोवहानि प्रमोहयन्त्याशु नरस्य चेतः॥ (C.S. VI. 9.5)

(*tairalpasatvasya malāḥ praduṣṭā buddhernivāsam hrudayaṁ pradūṣya |  
strootāmsyadhiṣṭāya manovahāni pramohayantyaśu narasya cetaḥ |*)

Due to the above (aetiological factors) the vitiated humors in a person with a deficiency of sattva get localized in the channels of the mind and afflicting its core, the seat of intelligence, quickly derange the mental functions of the person.

धीविभ्रमः सत्वपरिप्लवश्च पर्याकुला द्रुष्टिरधीरता च।

अबद्धवाक्यत्वं हृदयं च शून्यं सामान्यमुन्मादगदस्य लिङ्गम्॥ (C.S. VI. 9.6)

(*dhīvibhramah satvapariplavaśca paryākulā druṣṭiradhīratā ca |  
abaddhavākyaṭvaṁ hrudayaṁ ca śūnyaṁ sāmānyamunmādagadasya liṅḡgm |*)

Confused intellect, fickleness of the mind, perplexed look, restlessness, incoherent speech and mental (the Sanskrit word hridaya implies brain in the cortex) vacuum are the general clinical features of the disease known as insanity.

The above definition perfectly matches with the modern science definition of ADHD.

Cause for Unmāda

गर्भो वातप्रकोपेण दोहृदे वावमानिते।

भवेत् कुब्जः कुणिः पग्गुर्मूको मिन्मित एव वा॥ सु सं।२।२।५१।

*garbho vātaprakopeṇa dohrude vāvamānite |*

*bhavel kubjaḥ kuṇiḥ paḡgurmūko minmita eva vā || su saṁ |2|2|51|*

During pregnancy time if pregnant mother's wishes are not honored and gratified, the baby stands in danger, Mother gives birth to a child as humped, with deformed hand, lame dumb, or nasal voice through the deranged condition of the vaayu of mother's body.

कस्मात् प्रजां स्त्री विक्रुतां हीनाधिकारगी विकलेन्द्रिया वा।

देहात् कथं देहमुपैति चान्यमात्मा सदा कैरनुबध्यते च॥ च सं।२।२।२८।

*kasmāt prajāṁ strī vikrutāṁ hīnādhikārgī vikalendriyā vā |*

*dehāt katham dehamupaiti cānyamātmā sadā kairanubadhyate ca || ca saṁ |2|2|28|*

Why does a woman give birth to an abnormal child with deficient or excess of limbs or impaired sensory and motor organ? How does the soul transmigrate from one body to another?

बीजात्मकर्माशयकालदोषैर्मातुस्तथाहारविहारदोषैः।

कुर्वन्ति दोषा विविधानि दुष्टाः संस्थानवर्णेन्द्रियवैकृतानि॥ च सं।२।११।२१।

वर्षसु काष्ठाश्मधनाम्बुवेगास्तरोः सरित्स्रोतसि संस्थितस्य।

यथैव कुर्युर्विकृतिं तथैव गर्भस्य कुक्षो नियतस्य दोषाः॥ च सं।२।२।३०।

*bījātmakarmāśayakāladōṣairmātustathāhārahāradōṣaiḥ |*

*kurvanti doṣā vividhāni duṣṭāḥ saṁsthānavarṇendriyavaikrutāni || ca saṁ |2|11|21|*

*varṣasu kāṣṭhāśmadhanāmbuvegāstaroḥ saritsrotasi saṁsthitasya |*

*yathaiḥva kuryurvikrutim tathaiḥva garbhasya kukṣo niyatasya doṣāḥ || ca saṁ |2|2|30|*

Because of the defect in seeds (sperm, ovum), action associated with soul, uterus, time and food as well as regimen of the mother, doshas get variously vitiated. These result in the impairment of shape, color and sensory as well as motor organs of the child. As a tree standing in the current of a river is afflicted by the forceful downward movement of wood, stone pieces and water during the rainy season. Same way the fetus in the uterus of the mother gets afflicted with the vitiated doshas.

The Science of Illness according yoga-vāsiṣṭha

The origin and destruction of mental and bodily diseases, the pains that afflict the body are called the secondary diseases, that whilst the Vasanas that affect the mind are termed mental or primary diseases.

In **Ānandamaya Koṣa**, a man is healthiest with perfect balance of all his faculties. At **Vijñānamaya Koṣa** there are movements, but they are focused in the right direction. It is at the **Manomaya Koṣa** that the imbalance starts. Likes and dislikes come in action at this level. They start governing our actions, often in the wrong direction. The actions focused towards the wrong direction cause imbalance. These amplify themselves, resulting in mental illness called *Ādhi*.

At this level there are no symptoms at the physical level. Prompted by the permanent growth of desires, these mental illnesses get concealed in us, begin to manifest externally and gradually they percolate to the physical frame. The *Ādhi* is twofold namely -‘Samānya’ (ordinary) and ‘sāra’ (essential). The *ṣamānya Ādhi* is normally produced during the interactions with the world. These may be termed as psychosomatic ailments. When dealt with suitable techniques & congenial atmosphere, *ādhis* of the *Samānya* type will vanish. Along with it are destroyed the physical ailments i.e. ‘Vyādhis’ caused by the *ādhis* i.e. **Ādhija vyādhi**. When the mind is agitated during our interaction with the world at large, the physical body is also affected. The subtler ‘ādhis’ of essential type (*sāra*), which are caused at birth of the physical body, can only by realization of the causal, **Ānandamaya Koṣa** and **Vijñānamaya Koṣa**. In that state man transcends the cycles of birth and death. The imbalances in **Manomaya Koṣa** cause disturbances in the *prāṇic* body and unsteadiness in the *Nāḍi*, hence disturbing the digestive process. This gives rise to irregular, poor and over digestion. When the improperly digested food settles down in the body as a toxic waste, it results in ailments of the psychosomatic type. Ailments that don’t have their origin in the mind are called **Anādhija vyādhis**. It includes infectious and contagious diseases, which can be medically cured.

How mental diseases arise and how they are destroyed.

When the manas agitated, then this body also follows in its wake. And when the body is agitated, then there is no proper perception of the things. That is in one’s way and *Paraná* flies from its even path on to a bad road.

### Remedy for Unmaada:

According to kaṭhōpanisat:

इन्द्रियेभ्यः परं मनो मनसः सत्वमुत्तमम्।

सत्वादधि महानात्मा महतोव्यक्तमुत्तमम्॥ Kathōpanisat (2.3.7)

*indriyebhyaḥ param mano manasaḥ satvamuttamam/  
satvādadhi mahānātmā mahatovyaktamuttamam||*

The mind is superior to the organs the intellect is superior to the mind; Mahat is superior to the intellect; the un-manifested is superior to Mahat.

तां योगमिति मन्यन्ते स्थिराम् इन्द्रिय धारणाम्। Kathōpanisat (2.5.4)

*tām yogamiti manyante sthirām indriya dhāraṇām|*

Yoga is the state in which all our indriyas are beheld steadily i.e., a state of mastery over senses and mind.

The sense objects, belonging to the same class as the senses, are understood to be enumerated by the mention of senses.

According to Bhagavadgītā

चञ्चलं हि मनः क्लिष्ण प्रमाथि बलवद् द्रुढम्।

तस्याहं निग्रहं मन्ये वयोरिव सुदुष्करम्॥ BG Ch. 6 – S.34

*cancalam hi manaḥ kṛiṣṇa pramāthi balavad druḍham|*

*tasyāhaṁ nigrahaṁ manye vayoriva suduṣkaram||*

O Krishna! Verily, the mind is fickle, turbulent, powerful and unyielding. To control it, I think, is as difficult as controlling the wind itself.

असंशयं महाबाहो मनो दुर्निग्रहं चलम्।

अभ्यासेन तु कोन्तेय वैराग्येण च गृह्यते॥ BG Ch. 6 - S.35

*asamśayam mahābāhoo mano durnigrahaṁ calam/  
abhyaśena tu kounteya vairāgyeṇa ca gruhyate||*

O mighty armed one! Undoubtedly the mind is fickle and difficult to be checked. Yet, O son of Kuntī, it can be brought under control by dispassion and spiritual practice.

ध्यायतो विषयान् पुंसः संङ्गस्तेषूपजायते।

सन्गात् सम्जायते कामः कामात् क्रोधोऽभिजायते॥ BG CH-2 S-62

*dhyāyato viṣayān pumsaḥ saṅgas tesūpajāyate  
saṅgāt samjāyate kāmahaḥ kāmāt krodhoabhiajāyate*

In one who dwells longingly on sense objects, an inclination towards them is generated. This inclination develops into desire, and desire begets anger.

**According to patañjali yoga sūtra**

अथ योगानुशासनम्॥ Ch.I S-1

*atha yogānuśāsanam॥*

This is the beginning of instruction in Yoga.

Anushāsanam means instructions on how to practice Yoga-concentration, (mind) in detail.

The habitual states of mind are five they are-

1) kṣipta      2) Mudha      3) vikṣipta      4) ekāgra 5) Niruddha

- 1) Kṣipta – Lack of intelligence necessary for contemplation on super-sensuous subjects , and inability to think of any subtle principle.
- 2) Mudha – Dull-mindedness. The mind is always entangled in sense perceptions and thus, unable to think of subtle principles.
- 3) Vikṣipta- This is different from Kshipta mind. Even though having intelligence, the mind is always restless; that means, it is for some time calm and at other times disturbed. Concentration is possible even with such a restless mind. But, it cannot last long because of its wavering nature.
- 4) Ekāgra– It means ‘one-pointed’.
- 5) Nirudha – This is the most effective state and final state of mind, where all the thoughts can be withdrawn, for a very long time.

- विषयवती वा प्रवृत्तिरुत्पन्ना मनसह स्थितिनिबन्धनी
- viṣayavatī vā pravrutতিরুत्পন্না মনসহ স্থিতিনিবন্ধনী pys Ch. I S- 35
- The mind can be made steady by bringing it into activity of sense perceptions brought about by the enjoyment of senses, smell, taste, sound, feelings etc.

### **Summary**

ADHD is very clear that it is strongly related with the mind and the cure is in invoking the strength within. Considering the side effects of drugs in modern medicine and limitations associated with the therapy according to the ancient scriptures, treatment should be given taking the advantages of both modern science and ancient scriptures boosting the healing as fast as possible gradually reducing the drug necessity or even reaching to the state where there is no need of drugs. Yoga is a way which improves attention and reduces hyperactivity is a two way approach reducing negative increasing positive. Implementing Yoga in the activities they love should be the first approach for example Implementing Yogic Ethics in Games and introducing Krida Yoga, here the game should match the speed of the mind gradually as the mind gets involved or stuck in the game, where game becomes the dharana as the speed of the game is reduced the mind is conquered.

### **CONCLUSION**

- As we have explored the scriptures we have understood that ADHD is related with aticanalata of the mind, so while approaching ADHD people for Integrated yoga therapy, it is always good to start with practices which match the speed of the mind and then gradually decreasing the speed of the therapy carefully synchronizing with the speed of the mind and ultimately reaching the silence.

### **2.2 LITRATURE REVIEW**

Four studies, including 83 participants, are included in this review. Two studies used mantra meditation while the other two used yoga compared with drugs, relaxation training, non-specific exercises and standard treatment control. Design limitations caused high risk of bias



across the studies. Only one out of four studies provided data appropriate for analysis. For this study there was no statistically significant difference between the meditation therapy group and the drug therapy group on the teacher rating ADHD scale (MD -2.72, 95% CI -8.49 to 3.05, 15 patients). Likewise, there was no statistically significant difference between the meditation therapy group and the standard therapy group on the teacher rating ADHD scale (MD -0.52, 95% CI -5.88 to 4.84, 17 patients). There was also no statistically significant difference between the meditation therapy group and the standard therapy group in the distraction test (MD -8.34, 95% CI -107.05 to 90.37, 17 patients). (Krisanaprakornkit, Ngamjarus, Witoonchart, & Piyavhatkul, 2010)

Another study suggested that training-based measures are effective in improving cognitive skills. Meditation-based training has produced lasting changes in brain and cognitive functions. This technique of mental training exhibits neuroplasticity in the attentional networks, exhibiting superior performance, especially in the domain of attention and executive control processing, which is impaired in attention deficit hyperactivity disorder (ADHD). Although intervention techniques for ADHD are well researched, many individuals continue to experience significant functional impairment despite the symptom improvement. This emphasizes a need for a comprehensive approach that requires an effective behavioral intervention. The present paper provides a converging review of meditation-based effects on the brain, dysfunctions of ADHD, and suggestions for enhancement of cognitive abilities in patients with ADHD using meditational training combined with existing measures of intervention. The idea proposed herein should be considered a step for initiation of empirical studies on meditation-based training intervention and outcome effects (Baijal, & Gupta, 2008).

Stimulant medications are the mainstay of treatment; however, additional approaches are frequently desired. In recent years, mindfulness meditation has been proposed to improve attention, reduce stress, and improve mood. This study tests the feasibility of an 8-week mindfulness training program for adults and adolescents with ADHD. Twenty-four adults and eight adolescents with ADHD enrolled in a feasibility study of an 8-week mindfulness training program. The majority of participants completed the training and reported high satisfaction with the training. Pre-post improvements in self-reported ADHD symptoms and

test performance on tasks measuring attention and cognitive inhibition were noted. Improvements in anxiety and depressive symptoms were also observed. Mindfulness training is a feasible intervention in a subset of ADHD adults and adolescents and may improve behavioral and neurocognitive impairments. A controlled clinical study is warranted (Zylowska, Ackerman, Yang, Futrell, Horton, Hale, Pataki, & Smalley, 2007)

This before and after study design evaluated the use of yoga as a complementary treatment to medication to reduce the behavioral and attention deficit symptoms (i.e. inattentiveness, hyperactivity and impulsiveness) of ADHD in boys, ages 8-13. Boys diagnosed with ADHD were randomly assigned to a 20-session yoga group (n=11) or a control group (cooperative activities, n=8) and were assessed pre- and post-intervention on the Conners' Parent and Teacher Rating Scales-Revised (CPRS-R), the Test of Variables of Attention (TOVA) and the Motion Logger Actigraph. These scales were filled out by parents and teachers (not the same teacher each time) at home and at school. The yoga treatment was provided by a yoga instructor for one-hour a week, for twenty weeks and consisted of respiratory, postural, relaxation and concentration training exercises. The study found that despite randomization, there were significant differences between the control and yoga groups based on pretest scores for the Conners' Rating Scales rated by both parents and teachers. The TOVA had no significant effects for either yoga or control group. The actigraph monitors many technical problems leading to incomplete data set being collected. Thus they were deemed unreliable. The study results should be interpreted with great caution as the study had many flaws. The sample size was likely too small to find statistically significance differences between groups if they were truly important. There was cross-contamination between the intervention and control group. Parents were not blinded to the study purpose or group assignment which may have influence their ratings of their child if they expected benefits from the study. The study may have had greater value as a single-case multiple baseline design (Jensen, & Kenny, 2004).

The purpose of this before and after study was to determine the benefit of Sahaja Yoga Meditation (SYM) on improving stability of attention and concentration, motor activity, problems of inhibition, easily frustrated mood, poor self-esteem and difficulties at school of children with ADHD Forty-eight children (41 boys, 7 girls) met the criteria for inclusion in

the study (i.e., DSM-IV diagnosis of ADHD and a score of 15 or higher on the Conners Parent–Teacher Questionnaire). Thirty-one children were receiving medication (such as Ritalin or dexamphetamine), 14 were not medicated and medical information was not given for 3 of the children. Over a 6 week period, SYM techniques were taught to children and adults twice weekly for 90 minutes. For the first 3 weeks, the parents and children were in separate groups. For the last three weeks, one of the weekly meditation sessions was conducted jointly with parents and children, enabling the instructors to train parents in guiding their own child’s meditation. The study found that participants who showed a marked improvement in ADHD symptoms as measured by the Conners’ Parent Teacher Questionnaire. Post-treatment scores showed that SYM was associated with significant improvements in all of the parent-rated measures. (Harrison, Manocha, & Rubia, 2004).

The purpose of this single case design study was to examine the effectiveness of yoga on improving attention in elementary school children with attention problems. Participants were ten students, aged 6-10 years, with attention problems but without a diagnosis of ADHD. The children all had documented attention problems in the classroom as evidenced by less than 80% time-on-task during two structured observations by the school psychologist. The control group was matched on characteristics (i.e., gender, classroom attendance and demographics). The *Yoga Fitness for Kids* commercial videotape was shown to the students for 30 minutes, twice a week, for a period of 3 weeks. The videotapes instructed the students to engage in deep breathing, physical postures and relaxation exercises. The design included baseline, intervention and follow-up phases, using Behavioral Intervention Form, Social Validity Scale, Bush and Serline’s Approach One: No Assumptions Method and Treatment Integrity Checklist. The study found that on-task behaviors decreased slightly at follow-up, but generally re-mained higher than baseline levels. Time-on-task attention levels, as determined by the psychiatrist in the beginning of the study, remained essentially unchanged during the three phases of the study. The results of the study are limited by the small sample size, relatively short treatment (only three weeks), and the variation in activity during in-class observations of the students, effecting the variability of the data (Peck, Kehle, Bray, & Theodore, 2005).

## **CHAPTER 3**

### **AIM AND OBJECTIVES**

#### **3.1 AIM**

To study the effect of Suryanamaskara and Pranayama add on to IEP on ADHD children's attention and symptoms.

#### **3.2 OBJECTIVES**

To evaluate the attention using SLCT after combine practices of Suryanamaskara and Pranayama add on to IEP.

To evaluate the ADHD symptoms after combine practices of Suryanamaskara and Pranayama add on to IEP.

#### **3.3 HYPOTHESIS**

Yoga practices add on to IEP would increase attention on ADHD children.

#### **3.4 NULL HYPOTHESES**

Yoga practices add on to IEP would not improved attention and ADHD symptoms.

## CHAPTER-4

### METHODS

#### 4.1 SUBJECTS

##### 4.1.1 Sample Size

The sample size of the present study was 63 male and female ADHD children.

##### 4.1.2 Sources of the Subjects

Subjects were recruited from Bardhaman Swadhyay Welfare Society (Bardhaman) and National Institute of Mentally Handicap (Kolkata) with the ADHD children come regularly.

##### 4.1.3 Inclusion Criteria

- ADHD children
- Subjects who would understand instructions given in Bengali, Hindi and English. Motivation to practice and willingness to volunteer for the study.
- Age group were between 6-14 years

##### 4.1.4 Exclusion Criteria

- Presence of cognitive and / or psychiatric, neurological disorders based on a clinical examination and normal healthy children.

##### 4.1.5 Ethical Consideration

Subject's parents /guardians were explained about study in details and then consent forms were obtained from them.

#### 4.2 DESIGN OF THE STUDY

Present study was Pre-Post with control design. Children of NIMH was in control group, Children of Bardhaman Swadhyay Welfare Society (Bardhaman) was in yoga group.

##### Experimental Group

PRE	YOGA TRAINING and IEP TRAINING	POST
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##### Control Group

PRE	IEP TRAINING	POST
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### **4.3 ASSEMENTS**

SIX LETTER CANCELATION TEST and ADHD test were assessed on 1<sup>st</sup> day and again taken after 4 months intervention for both yoga and control group.

### **4.3 INSTRUMENTS**

#### **4.3.1 SIX LETTER CANCELATION TEST**

Work sheet consists of two parts, the key, mentioning 6 target letters and the working section. The working section displays randomized alphabets arranged in rows and columns. The worksheet has 22 rows and 14 columns. The subjects are asked to cancel as many target alphabets as possible in the specified time of 90 seconds. The letter cancellation may be undertaken in a horizontal, vertical or randomized manner by selecting a particular key letter. The total number of cancellations and wrong are scored (Natu & Agarawal, 1997).

### **4.3. DATA EXTRACTION**

**1. Six letter cancellation test (SLCT):** The net score for each individual under different experimental conditions will be recorded.

#### **4.3.2 ADHD symptoms Rating Scale:**

ADHD Symptoms rating Scale is a tool by which we can measure the behavioral, social and educational status of a child by list of question answer and observation. There are 56 questions and each question have five blocks (Melissa, Gretchen, & Kenneth, 2001).

### **4.4 INTERVENTION**

Yoga Group

#### **4.4.1 Suryanamaskāra**

1. The suryanamaskāra which is a twelve sets of asanas the twelve postures

Sthiti: Pranāmasana (prayer pose)

Stand erect with the feet together or slightly apart and close the eyes. Place both palms together in front of the chest (namaskara mudra). Maintain your awareness on the mudra, the pressure of the palms and the effect of this mudra on the chest area. Mentally offer homage to the sun, the source of all life. Relax the whole body.

Breathing: Breathe normally.

**Position 1:** Hasta uttānāsana (raised arms pose)

Raise and stretch both arms above the head, with palms facing upwards. Keep the arms separated, shoulder width apart. Arch the back and stretch the whole body. Stretch the head as far back as is comfortably possible and be aware of the curve of the upper back.

Breathing: Inhale while raising the arms.

**Position 2:** Pādahastāsana (hand to foot pose)

In a continuous movement bend forward from the hips. Bring the hands to the floor on either side of the feet and try to touch the knees with the forehead. Do not strain. The legs should remain straight. Try to keep the back straight, (using your awareness at the pelvis, the pivoting point for the stretch of the back and leg muscles.

Breathing: Exhale while bending forward. Try to contract the abdomen in the final position to expel the maximum amount of air from the lungs.

Contra-indications: People with back conditions should not bend forward fully. Bend from the hips, keeping the spine straight, until the back forms a ninety degree angle with the legs, or bend only as far as is comfortable.

**Position 3:** Aśva sancālana (equestrian pose)

Keeping both hands in place, on either side of the feet, bend the left knee while extending the right leg backwards as far as possible. The right toes are tucked under and the knee is touching the floor. Bring the pelvis forward, arch the spine and look up. The fingertips touch the floor and balance the body. Focus your awareness at the eyebrow centre. You should feel the stretch from the thigh moving upward along the front of the body all the way to the eyebrow centre.

Breathing: Inhale while bringing the chest forward and up and stretching the right leg back.

**Position 4:** Santūlāsana (Plank pose)

In this step, exhale and the left leg also back, resting only on palms and toes. Keep the body straight from head to toes inclined to the ground at about thirty degrees. Take care to keep the neck in line with the back.

**Position 5:** Sasakñāsana (Rabbit pose)

While inhaling, bend the legs at the knees and rest them on the floor with buttocks resting on the heels without altering the position of the palms and toes. Exhale as you rest the forehead on the floor. Then relax normal breathing.

**Position 6:** Ashtanga Namaskara (salute with eight parts or points)

Lower the knees to the floor and then bring the chest and chin to the floor, keeping the buttocks elevated. The hands chin, chest, knees and toes touch the floor and the spine is arched. Focus the awareness at the centre of the body or on the back muscles.

Breathing: The breath is held outside in this pose. There is no respiration.

**Position 7:** bhujangāsana (cobra pose)

Lower the hips while pushing the chest forward and upward with the arms. Straightening the elbows, arch the back and push the chest forward into the cobra pose. The legs and lower abdomen remain on the floor and the arms support the trunk. Unless the spine is very flexible the arms will remain slightly bent. Focus the awareness at the base of the spine feeling the tension from the forward pull.

Breathing: Inhale while raising the torso and arching the back.

**Position 8:** Parvatasana (mountain pose)

This stage is a repeat of position 5. Keep the arms and legs straight. While pivoting from the shoulders raise the buttocks and bring the head down to reassume position 5. The hands and feet do not move from position 7. Raise the buttocks and lower the heels to the floor.

Breathing: Exhale while raising the buttocks.

**Position 9:** Sasankasana (Rabbit pose)

While inhaling, bend the legs at the knees and rest them on the floor with buttocks resting on the heels without altering the position of the palms and toes. Exhale as you rest the forehead on the floor. Then relax normal breathing.

**Position 10:** Ashwa Sanchalanasana (equestrian pose)

This stage is a repeat of position 4. Bring the left leg forward, placing the foot between the hands. Simultaneously bring the right knee down to the floor and push the pelvis forward. Arch the spine and look up to reassume position 4.

Breathing: Inhale while assuming the pose.



**Position 11:** Pādahastāsana (hand to foot pose)

This stage is a repeat of position 3. Bring the right foot in beside the left. Straightening the legs, bend forward and raise the buttocks while bringing the head in towards the knees. The hands remain on the floor beside the feet. This is the same as position 3.

Breathing: Exhale while performing the movement.

Position 12 hasta uttānāsana (raised arms pose)

This stage is a repeat of position 2. Bend from the hips, raise the torso and stretch the arms above the head. Arch backwards to reassume position 2.

Breathing: Inhale while raising the torso and arms.

Sthiti: pranāmasana (prayer pose)

This stage is a repeat of position 1. Straighten the body and bring the hands together in front of the chest, reassuming position 1. Breathing: Exhale while assuming the final position (Nagaratna, & Nagendra, 2008).

**4.4.2 Prānāyāma**

1. The Nadisuddhi Pranayama, which is alternative breathing practices by manipulating the breathing by nasikā mūdra (hand gesture) for five minutes followed by one minute of rest.
2. The bhrāmari prānāyāma , which is practiced by producing humming bee sound during exhalation. This practice was carried out for five minutes. (Nagaratna, & Nagendra, 2008).

4.4.3. Individualized educational program was given according to the guideline of Rehabilitation council of India (RCI) recommended on special education for ADHD children behavior modification and general education which includes counseling; teaching with play method, education based on understanding and development criteria which accelerates children growth as fast as possible.

**For Control Group**

1. Individualized educational program according to the guideline of Rehabilitation council of India (RCI) recommended on special education for ADHD children behavior modification and general education which includes counseling; teaching with play method, education based on understanding and development criteria which accelerates children growth as fast as possible.

#### **4.5: Data Analysis**

Data was analyzed using SPSS 10. A repeated measure ANOVA was used between subject factor analysis i.e. yoga and control and for the within subject factors (pre and post). Post hoc bonferroni adjustment was used for multiple comparisons'.

## CHAPTER-5

# RESULTS

The present study consisted of 63 ADHD children with age range 6 to 14 year.

**Table 1: Mean  $\pm$ SD Age of Yoga and Control group.**

GROUP	Mean	N	S.D
Yoga	10.91	32	1.94
Control	11.19	31	1.64
Total	11.05	63	1.79

**Table 2: Mean  $\pm$ SD Age of Gender.**

Sex	Mean	N	S.D
Male	11.00	39	1.81
Female	11.13	24	1.80
Total	11.05	63	1.79

### 5.1. Six letter cancellations test

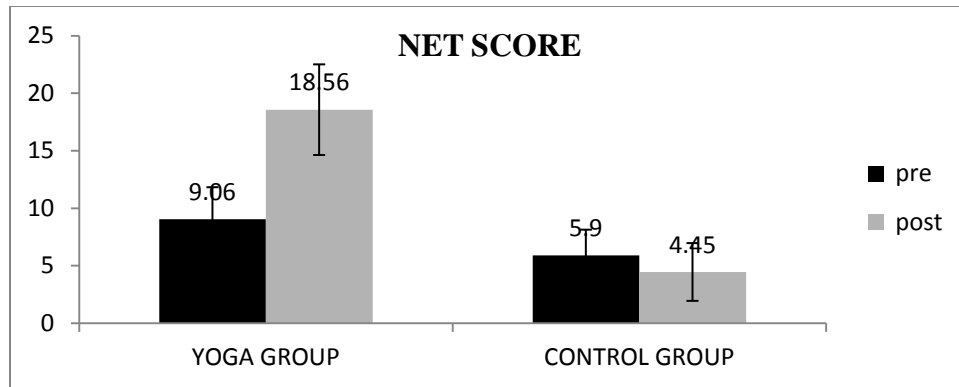
There were significant increase in total score (62.19%  $p < 0.001$ ) and net score (104.86%  $p < 0.001$ ) but decrease in wrongly attempt (69.28%,  $p < 0.001$ ) when post score compared with pre in Control Group. There were significant decreases in total attempt (14.55%  $p > 0.016$ ) and decrease in net attempt (24.58%  $p > 0.012$ ) in post score compared to pre score.

**Table 5.1: Mean and SD score of Total, Wrong and Net of Six Letter cancellations test.**

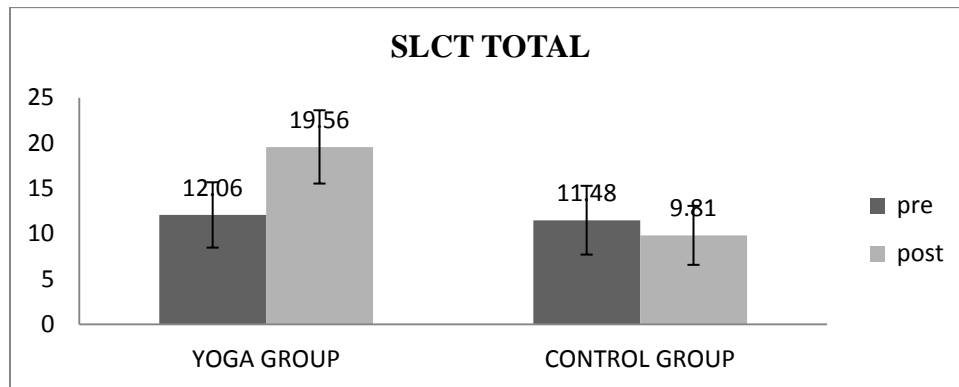
	Yoga group			Control group			Group*time
	Pre	Post	P values (% change)	Pre	Post	P values (% change)	
<b>Total score</b>	12.06 $\pm 3.60$	19.56 $\pm 4.04$ ***	0.001 (62.19%)	11.48 $\pm 3.79$	9.81* $\pm 3.25$	0.016 (14.55%)	<0.001
<b>Wrong score</b>	3.06 $\pm 2.06$	0.94 $\pm 1.05$ ***	0.001 (69.28%)	5.52 $\pm 3.56$	5.35 $\pm 2.73$	0.766 (3.08%)	0.012
<b>Net score</b>	9.06 $\pm 2.76$	18.56 $\pm 3.94$ ***	0.001 (104.86%)	5.90 $\pm 2.23$	4.45* $\pm 2.51$	0.012 (24.58%)	<0.001

\* $P < 0.05$ , \*\*\* $P < 0.001$ ; RMANOVA with Bonferroni adjustment.

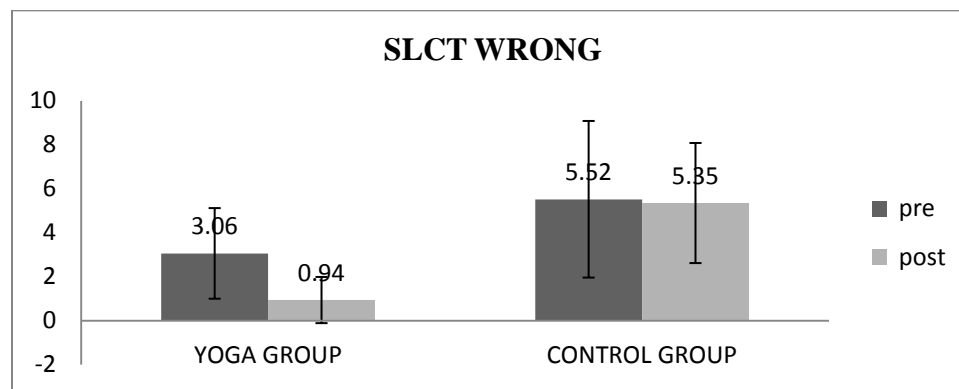
**Graph 5.1A: Change of Net cancellation score in Yoga and Control Groups**



**Graph 5.1B: Change of Total cancellation score in Yoga and Control Groups**



**Graph 5.1C: Change of Wrong cancellation score in Yoga and Control Groups**



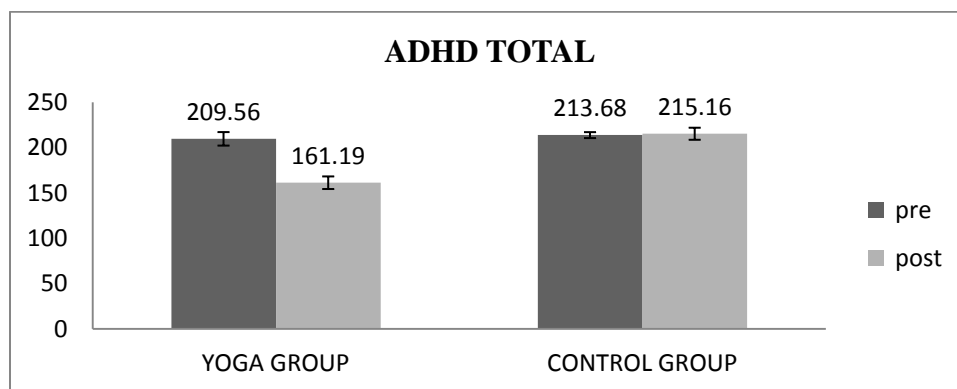
There were significant improvement in HI Score (23.02%,  $P < 0.001$ ) IN Score (23.02%,  $P < 0.001$ ) and Total Score (23.08%,  $P < 0.001$ ) in Yoga Group but there were no significant change in HI Score (0.13%,  $P = 0.334$ ), IN Score (1.53%,  $P = 0.128$ ) and Total Score (0.67%,  $P = 0.876$ ) in control group. Yoga Group was significantly improved better than control group in HI, IN, and Total Score ( $P < 0.001$ ).

**Table 5.2: Mean and SD of ADHD symptoms rating scale score**

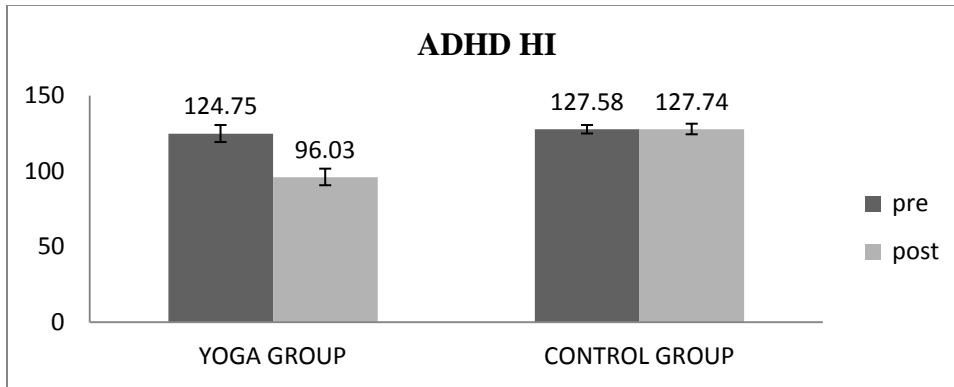
	Yoga Group			Control Group			Group *time
	Pre	Post	P values (% change)	Pre	Post	P values (% change)	
<b>HI</b>	124.75 ±5.63	96.03 ±5.49***	0.001 (23.02%)	127.58 ±2.81	127.74 ±3.51	0.334 (0.13%)	<0.001
<b>IN</b>	84.81 ±2.33	65.16 ±2.92***	0.001 (23.17%)	86.1 ±1.78	87.42 ±5.13	0.128 (1.53%)	<0.001
<b>TOTAL</b>	209.56 ±7.44	161.19 ±6.94***	0.001 (23.08%)	213.68 ±3.27	215.16 ±6.65	0.876 (0.67%)	<0.001

\*\*\* $P < 0.001$ ; RMANOVA with Bonferone adjustment.

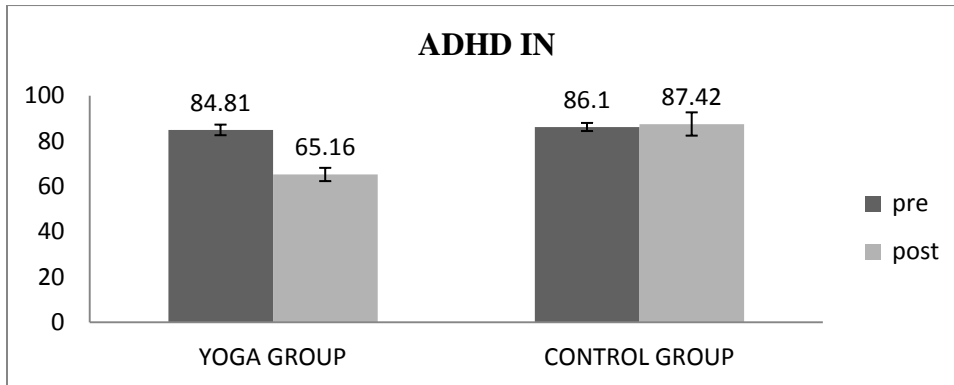
**Graph 5.2A Change of ADHD Total Score in Yoga and Control Groups**



**Graph 5.2B Change of ADHD HI Score in Yoga and Control Groups**



**Graph 5.2C Change of ADHD IN Score in Yoga and Control Groups**



## **CHAPTER-6**

### **DISCUSSION**

Present study found significant improvement the Total, Net score in the yoga group. But the Magnitude of change of Net score in yoga group (104%) much higher than the control group (24%). The yoga group significantly improved in wrongly score but control group did not. The yoga group significantly performed better compared to control group in SLCT test. ADHD symptoms score also improved in Yoga add-on group alone but not in control group. The significant improvement of yoga was better compared to control group.

Six Letter Cancellation Test and digit letter substitution test score improved following immediately after 22:30 min of Cyclic Meditation and Supine Rest in normal children population within a seven days of training program (Balaram, & Nagendra, 2010) which is similar finding to present study.

#### **Mechanism**

A study reported that yoga class participation helped students improve their behavior, physical health and academic performance, and also improved students' attitudes toward themselves (Slovacek, Tucker, & Pantoja, 2003). Children participating in yoga training program reported improvements in negative behaviors in response to stress, wellbeing, specifically in behaviors. These results suggested possible role of yoga as a preventive intervention as well as a means of improving children's perceived well-being (Berger, Silver, & Stein, 2009).

Combination of yoga asana intersperse with relaxing found inhibition in control area of brain measure through Middle Latency Evoke Potential (Subramanyam & Telles). The present study both combination of Suryanamaskara and Bhramari Pranayama might be contributed in improvement in SLCT.

## CHAPTER-7

### SUMMARY AND CONCLUSION

**SUMMARY:** Add-on yoga with IEP found better improvements compared to alone IEP training programs.

**CONCLUSION:** Yoga should be included with the IEP training program to improve their performance.

**Strength of the study:** Pre and post with control study.

**Limitation of the study:** The sample was a convenient.

**Future work:**

Randomize control study should be plan.

Yoga group should include other aspect i.e. Different asanas, pranayama.

Need an active control with simple form of exercise



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**APENDIX-1**

**SIGNED INFORMED CONSENT FORM**

**Title of the project** : Effect of Yoga on Children with ADHD.

**Investigator** : Dibyendu Bandopadhyay

**Names of the guide** : Dr. Balaram Pradhan

**Name of the participants** :

**Age and Gender** :

**Date and time** :

**About The project** : To understand the effects of Yoga on ADHD children, we are going to measure the attention span in the subjects using six letter cancellation test and ADHD Symptoms. This technique is non-invasive and commonly used in routine clinical practice.

Please note:

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1. All the information obtained during the study will be kept Confidential and individual report of the test will be given.
2. You can withdraw from the study at any point of the time Unconditionally.
3. In case the study does adverse effects, the institution is not liable.

I have understood the above and consent voluntarily to participate in the study.

Place \_\_\_\_\_

Date \_\_\_\_\_

Signature of the guardian