

EFFICACY OF *TRATAKA* ON ATTENTION IN CHILDREN

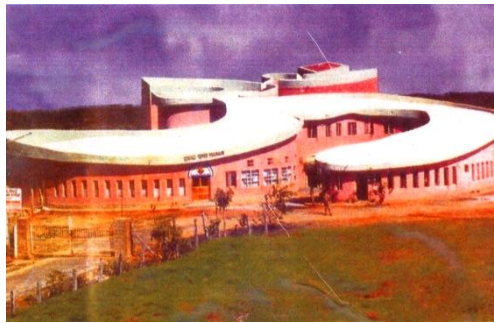
Dissertation submitted by

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Under the Guidance of

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Towards partial fulfilment of

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C E R T I F I C A T E

This is to certify that Sravan P.K. is submitting this Literary research entitled “**Various types of *trataka* according to scriptures.**” and Experimental research entitled “**Efficacy of *trataka* on attention in children**” in partial fulfilment of the requirement for the Master of Science (Yoga and Education) registered with effect from January, 2010 by the Swami Vivekananda Yoga Anusandhana Samsthana under the division Humanity and is a record of the work carried out by him in this institute.

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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.Manjunath N.K. and Dr.Balaram Pradhan.

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

Various types of *trataka* according to the scriptures.

PART – II

Efficacy of *trataka* on attention in children.

Place: Bangalore

Sravan P.K.

Date:

(Candidate)

A C K N O W L E D G E M E N T

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.Manjunath N.K. and Dr.Balaram Pradhan for their encouragement and guidance. Their contribution in my development cannot be expressed in words.

I thank all the members of the faculty and my friends, for their moral support. I acknowledge with thanks to school 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 family and parents for their love and support.

Finally I thank that unseen Divine without whose wish, this work wouldn't have been possible.

Bangalore

Date:



**STANDARD INTERNATIONAL TRANSLITERATION CODE USED TO
TRANSLITERATE SANSKRIT WORDS**

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ABSTRACT

OBJECTIVES

To study the changes in performance of a task requiring attention (Six Letter Cancellation Test) following the practice of त्राटक (trāṭaka) compared to no intervention control group.

METHODS

63 school children between the age range 8 – 13 years belonging to both genders were recruited. Subjects were randomly allocated to Yoga (n = 32) and control (n = 31) groups. Subjects were assessed at the beginning and end of 40 days of Yoga intervention or No-intervention in case of control group using a Six Letter Cancellation Test. The yoga group received a specialized *Yoga Kriya* (an internal cleansing practice) viz., त्राटक (trāṭaka) while the control group received no intervention.

RESULTS

In the present study pair wise comparison shows significant increase from 29.09 ± 8.54 to 42.22 ± 6.20 in the total score of the yoga group ($P < .0001$) and also shows significant increase from 29.03 ± 8.48 to 42.16 ± 6.20 in the net score of the yoga group ($P < .0001$). The control group showed no significant change (post values compared with the respective Pre values) in total score and net scores.

CONCLUSION

Practice of त्राटक (trāṭaka) improved the ability to focus and sustain attention in school children.

Index

Part 1

Various types of *Trataka* according to scriptures.

S.No:	Chapter No:	Title	Page No:
1.	1.0	Introduction.	12
2.	2.0	Literature review.	13-23
3.	2.1	Origin and meaning of <i>trataka</i> .	13
4.	2.2	How <i>trataka</i> is a yogic practice..?	13-14
5.	2.3	Posture.	14
6.	2.4	Types of <i>trataka</i> .	14-15
7.	2.4.1	Types of <i>antaranga trataka</i> and <i>bahiranga trataka</i> .	15-17
8.	2.5	Precautions and guidelines.	17-18
9.	2.6	Effects and benefits.	18-21
10.	2.6.1	Scriptural and spiritual.	18
11.	2.6.2	Psychological.	20
12.	2.6.3	Nervous system – Brain waves.	20
13.	2.6.4	Sympathetic and parasympathetic nervous system.	20
14.	2.6.5	Mental Health.	21
15.	2.6.6	Visual Perception.	21
16.	2.6.7	Physical.	21
17.	2.6.8	Therapeutic.	21
18.	2.7	Comparison and similarities between <i>trataka</i> and <i>dhyana</i>	22
19.	3.0	Summary.	23

Part 2

Effect of *trataka* on attention in children.

S.No:	Chapter No:	Title	Page No:
1.	1.0	Introduction.	25-26
2.	2.0	Aims and objectives.	27
3.	2.1	Aim.	27
4.	2.2	Objective.	27
5.	2.3	Hypothesis.	27
6.	2.4	Null hypothesis.	27
7.	3.0	Methods.	28-35
8.	3.1	Sample size.	28
9.	3.2	Source of subjects.	28
10.	3.3	Inclusion criteria.	28
11.	3.4	Exclusion criteria.	29
12.	3.5	Ethical consideration.	29
13.	3.6	Design of study.	29
14.	3.7	Assessments.	29-30
15.	3.7.1	Instruments.	29-30
16.	3.8	Intervention.	30-35
17.	3.8.1	Module of intervention for yoga group.	30-35
18.	3.8.2	Intervention for control group.	35
19.	3.9	Data extraction.	36
20.	3.10	Data analysis.	35
21.	4.0	Results.	36-37
22.	4.1	Tables.	36-37
23.	4.2	Graph.	37
24.	5.0	Discussion.	38-39

25.	6.0	Appraisal.	40-41
26.	6.1	Summary.	40
27.	6.2	Conclusion.	41
28.	6.3	Limitations.	41
29.	6.4	Strength.	41
30.	6.5	Future studies.	41
31.	7.0	References.	42-44
32.	8.0	Appendix.	

Part 1

VARIOUS TYPES OF *TRATAKA* ACCORDING TO SCRIPTURES

CHAPTER 1

Introduction

त्राटक (trāṭaka) is the practice of staring at some external object. It is used in yoga as a way of developing concentration, strengthening the eyes, and stimulating the आग्नाचक्र (āgnācakra). In its first stage, the practitioner fixes his attention on a symbol or यन्त्र (yantra), such as the ओंकार (omkāra) symbol, a black dot, or the image of some deity, and stares at it, paying attention to each thought and feeling as it arises, and letting them go, so that the mind is completely absorbed in the symbol. The practice continues until the eyes begin to water, at which point they are closed, and relaxed.⁽⁵⁾

The second stage will be a real after-image, but later, it will exist only in the mind's eye, and the exercise in concentration comes from trying to maintain it there for a long period of time.^(3, 5)

त्राटक (trāṭaka) is supposedly the technique which साधक (sādhaka) use to develop psychic powers. त्राटक (trāṭaka) on the Sun or one's own mirror image is considered to be extremely powerful, but without a guru's assistance it can be dangerous to try these.^(4, 6)

CHAPTER 2

Literature Review

2.1 Origin and Meaning of त्राटक (trāṭaka)

त्राटक (trāṭaka) is called as “त्रोटक (troṭaka)” in हठरत्नावलि (haṭharatnāvali). The word त्राटक (trāṭaka) is derived from the word त्रुति (truti). त्राटक (trāṭaka) is a method of joining pieces which are linear, that is a method of creating a line of radiance with gradual efforts thus attempting to stabilize the gaze. When one achieves the stability of gaze in half a निमेश् (nimeś), the निमेश् (nimeś) refers to duration required for opening or closing of the eyelids. A thirtieth part of a निमेश् (nimeś), is known as तत्त्वर (tatvar) and a hundredth part of तत्त्वर (tatvar) is known as a त्रुति (truti).^(1, 4) त्राटक (trāṭaka) is a method of steadying one’s gaze akin to a crow, that is fixing the gaze in one direction and turning around.^(3,5) त्राटक (trāṭaka) also means fixing the gaze on an object without blinking till it is impossible to keep the eyes open or till they start watering.⁽³⁾

2.2 How त्राटक (trāṭaka) is a Yogic Practice..?

Yoga is derived from Sanskrit word युज् (yuj) which means union. Union of जीवात्मा (jīvātmā) with परमात्मा (paramātmā) on other words union of microcosmic energy with macrocosmic energy. Yoga is a state where one is aware of the connection between the self and the cosmos.^(3, 4) Ancient Yogis have experimented with different practices and systemised yoga which also includes practices for purification called as षट् क्रिया (ṣaṭ kriyā). षट् (ṣaṭ) means six and क्रिया (kriyā) means action. Here, action refers to cleansing action.^(1, 3, 4) कपालभाति (kapālabhāti), नेति (neti), धौति (dhaūti), बस्ति (basti), नौलि (nauli), and त्राटक (trāṭaka) are the six क्रिया (kriyā) . So, त्राटक (trāṭaka) is one of the षट् (ṣaṭ) क्रिया (kriyā).

क्रिया (kriyā) in yoga refers to cleansing action which purifies at physical level, mental level, emotional level, *Pranic* level, Spiritual level, Etc.^(1, 3, 4)

2.3 Posture

त्राटक (trāṭaka) should be done in a meditative sitting posture such as सिद्धासन (siddhāsana), पद्मासन (padmāsana), वज्रासन (vajrāsana) or सुखासन (sukhāsana). वाचस्पत्यम् (vācaspathyam) quotes from हठयोगप्रदिपिका (haṭhayogapradipikā) that त्राटक (trāṭaka) is better performed in सुखासन (sukhāsana). One should be aware of retaining natural arch of Spinal cord and slow rhythmic breathing while practising त्राटक (trāṭaka).^(7, 14)

2.4 Types of त्राटक (trāṭaka)

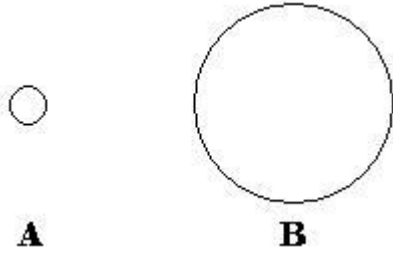
- There are two types of त्राटक (trāṭaka) namely अन्तरंग (antaraṅga) त्राटक (trāṭaka) and बहिरंग (bahiraṅga) त्राटक (trāṭaka).^(8, 9)
- बहिरंग (bahiraṅga) त्राटक (trāṭaka) means staring at an external object without blinking eyes till eyes starts watering. So, बहिरंग (bahiraṅga) त्राटक (trāṭaka) can be literally translated as External त्राटक (trāṭaka).^(8, 9)
- अन्तरंग (antaraṅga) त्राटक (trāṭaka) is looking at an object with inner vision, that is, with the mind, keeping the eyes closed. After practising बहिरंग (bahiraṅga) त्राटक (trāṭaka) for a period of time then, the practitioner can develop power of imagination and can imagine the object of त्राटक (trāṭaka) with closed eyes at eyebrow centre, heart or any other internal organ. So, when practitioner either by practising बहिरंग (bahiraṅga) त्राटक (trāṭaka) or naturally develops to visualise object of त्राटक (trāṭaka)

with closed eyes and able to fully concentrate on that then it is called as अन्तरंग (antaramāṅga) त्राटक (trāṭaka). Literally अन्तरंग (antaramāṅga) त्राटक (trāṭaka) can be translated as Internal त्राटक (trāṭaka).^(8, 9, 10)

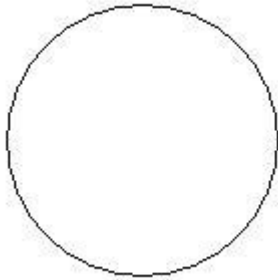
2.4.1 Types of अन्तरंग (antaramāṅga) त्राटक (trāṭaka) and बहिरंग (bahiramāṅga)

त्राटक (trāṭaka)

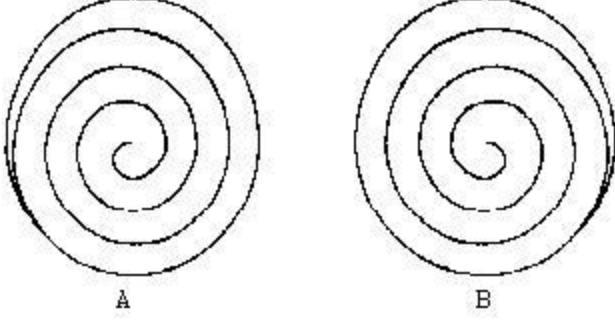
- बिन्दु (bindu) त्राटक (trāṭaka) – बिन्दु (bindu) means dot. In this त्राटक (trāṭaka) is done on a dot.⁽¹⁵⁾
- मुर्ति (murti) त्राटक (trāṭaka) – मुर्ति (murti) means idol so, when त्राटक (trāṭaka) is done on idol it is called as मुर्ति (murti) त्राटक (trāṭaka).⁽¹⁶⁾
- वर्तुल (vartul) त्राटक (trāṭaka) – Gazing on a circle is called वर्तुल (vartul) त्राटक (trāṭaka). Size can be altered according to the practitioners comfort level.⁽¹¹⁾



- परिग (parig) त्राटक (trāṭaka) – moving the gaze along the circumference of a circle. It can be done in two ways, number one approaching in clockwise direction and number two approaching in anti clockwise direction.⁽¹¹⁾



- वलय् (valay) त्राटक (trāṭaka) – Moving the gaze in a spiral manner. वलय् (valay) त्राटक (trāṭaka) is also done in two ways, number one approaching in clockwise direction and number two approaching in anti clockwise direction.⁽¹²⁾



- भिन्ट (bhinṭa) त्राटक (trāṭaka) – Practising त्राटक (trāṭaka) on wall with stains or faded paint is called (भिन्ट bhinṭa) त्राटक (trāṭaka).⁽¹³⁾
- मह (maha) त्राटक (trāṭaka) – The word मह (maha) means vast. So, मह (maha) त्राटक (trāṭaka) is practising त्राटक (trāṭaka) on vast objects. It helps one to acquire the ability to view entire aura around a person's head.⁽¹⁸⁾
- ज्योति (jyoti) त्राटक (trāṭaka) - ज्योति (jyoti) means light. So, त्राटक (trāṭaka) done on a flame is called as ज्योति (jyoti) त्राटक (trāṭaka).^(3, 4)
- सुर्य (surya) त्राटक (trāṭaka) – when doing त्राटक (trāṭaka) on the sun when its intensity is mild without any discomfort during the time of rising or setting is called as सुर्य (surya) त्राटक (trāṭaka).⁽¹⁷⁾
- चन्द्र (candra) त्राटक (trāṭaka) – त्राटक (trāṭaka) when done on moon is called as चन्द्र (candra) त्राटक (trāṭaka).⁽¹⁷⁾
- जल (jala) त्राटक (trāṭaka) – जल (jala) means water. So doing त्राटक (trāṭaka) taking water as object of त्राटक (trāṭaka) is called as जल (jala) त्राटक (trāṭaka). Since water is mostly not still it cannot be used for doing त्राटक (trāṭaka). Even if the water is still because of its transparency it amounts to doing त्राटक (trāṭaka) on the vessel in which

the water is stored rather than the water. When doing त्राटक (trāṭaka) on water, the edge of flowing water, edge of a waterfall, ripples created by breeze on still waters, Etc. are used as objects.⁽¹⁸⁾

- दक्षिण (dakṣiṇa) जत्रु (jātru) त्राटक (trāṭaka) – Here, the face is forward but the gaze is at the tip of the right shoulder.⁽¹⁴⁾
- वाम (vāma) जत्रु (jātru) त्राटक (trāṭaka) – त्राटक (trāṭaka) is done by gazing at the tip of the left shoulder but the face is forward.⁽¹⁴⁾
- भ्रुमध्य (bhrumadhya) त्राटक (trāṭaka) – भ्रुमध्य (bhrumadhya) is literally translated as midpoint between eyebrows. So, gazing at the eye brow centre is called as भ्रुमध्य (bhrumadhya) त्राटक (trāṭaka).⁽¹⁰⁾
- नाशिकाग्र (nāśikāgra) त्राटक (trāṭaka) – नाशिकाग्र (nāśikāgra) means nose so, performing त्राटक (trāṭaka) taking one's tip of the nose as the object of *trataka* is called as नाशिकाग्र (nāśikāgra) त्राटक (trāṭaka).⁽⁷⁾
- प्रतिकोपासन (pratikopāsana) – प्रतिकोपासन (pratikopāsana) is doing त्राटक (trāṭaka) on the shadow of the practitioner which is projected during the time of rising Sun or Moon. Here, first the gaze is fixed at the neck of the shadow and then gaze is shifted to the sky.⁽¹⁸⁾

2.5 Precautions and Guidelines

- त्राटक (trāṭaka), like other yogic exercises should be learned under the direct guidance of some accomplished yoga guru; otherwise there is every possibility that eye muscles as well as the nervous system may be affected.⁽¹⁹⁾
- Eyes should be splashed with clean water immediately after the त्राटक (trāṭaka) practice.⁽²¹⁾
- Avoid using external eye medicine or solution after त्राटक (trāṭaka). Also avoid rubbing the eyes, even in the beginning of त्राटक (trāṭaka) where some strain is felt due to adaptation of eyes for the practice.⁽²¹⁾

- Avoid doing त्राटक (trāṭaka) on the burning sun. For better eye health, it is advised to sit with closed eyes, facing the sun.⁽²⁰⁾
- Practitioners should avoid Optical glasses and contact lens and should continue practice with blurry vision.⁽²⁰⁾
- Sit with natural arch of spinal cord.⁽¹⁹⁾
- During the practice whole body should be stable except the eye balls.⁽²⁰⁾
- Whenever strain is felt at the eyes during the practice, such times palming is done by rubbing palms one against each other vigorously, it generates heat and प्राण (prāna), which is used to relax the eyes by placing palms over the sockets of eyeballs that there is complete darkness in front of eyes and don't let palms touch or press the eyeballs.⁽²⁰⁾
- The facial muscles, eyebrows and eyelids should remain totally relaxed.⁽¹⁹⁾
- Avoid undue strain to eyes.⁽¹⁹⁾
- If the त्राटक (trāṭaka) is done on flame then the practitioner should make sure the flame is not flickering. Room should be filled with stilled air.⁽¹⁹⁾
- Beginners may find difficult in sitting for long time. Constant practice and patience is required to go through adaptation process of the body.⁽¹⁹⁾
- Time spend for gazing should be gradually increased.⁽²⁰⁾
- Hypertensive persons should perform त्राटक (trāṭaka) after the practice of शवासन (śavāsana).⁽²³⁾
- Practitioner should not try to read or watch television immediately after त्राटक (trāṭaka).⁽²³⁾

2.6 Effects and Benefits of त्राटक (trāṭaka)

2.6.1 Scriptural and Spiritual

- नाशिकाग्र (nāśikāgra) त्राटक (trāṭaka) – Gazing at the tip of the nose reduces क्लेश (kleśa) (Mental Tensions).⁽⁷⁾

- भ्रुमध्य (bhrumadhya) त्राटक (trāṭaka) – Gazing at the eyebrow centre facilitates attainment of खेचरि (khecari) mudra (Higher yogic practice).⁽⁵⁾
- By constant practice of त्राटक (trāṭaka), दिव्य (divya) दृष्टि (dr̥ṣṭi) (clairvoyance) is developed.⁽¹⁶⁾
- भक्ति (bhakti) सागर (sāgara) claims that whatever idea is contemplated during the त्राटक (trāṭaka) practice, it will be actually be fulfilled.⁽⁶⁾
- त्राटक (trāṭaka) helps to develop concentration and also improves memory.⁽²³⁾
- Practitioner develops willpower as it gets invoked while controlling blinking.⁽²³⁾
- त्राटक (trāṭaka) is an excellent preparation for meditation.⁽¹⁹⁾
- आग्नाचक्र (āgnācakra) activates with the practice of त्राटक (trāṭaka).⁽¹⁾
- त्राटक (trāṭaka) is a fine exercise for a wandering mind. It gives total concentration and thoughtless.⁽²³⁾
- त्राटक (trāṭaka) helps to attain perfection in संयम (saṁyama) (higher yogic state).⁽²⁵⁾
- According to School of कुण्डलिनी (kuṇḍalinī) yoga the energy is conserved in avoiding blinking during त्राटक (trāṭaka), this energy can be then utilised to make spiritual progress.⁽³⁹⁾
- Doing त्राटक (trāṭaka) decreases the रजः (rajaḥ) component and thus the proportion of सत्व (satva) component increases.⁽¹⁹⁾
- Activation of subtle sense of vision “प्रकाशभाश (prakāśabhāśa)” (Comprehension of the language of light), along with प्रनयाम (pranayāma) one can comprehend the language of sound “नादभाश (nādabhāśa)” then one can interpret any language, even that of birds and animals.^(15, 18)
- Practitioner whose प्रकाशभाश (prakāśabhāśa) is activated can be able to view aura around a person or object and also able to get a vision of deities.⁽¹⁸⁾

2.6.2 Psychological

- During initial practice of त्राटक (trāṭaka), the sub-conscious and the unconscious mind gets activated and thus helps to bring back certain repressed experiences to the level of consciousness.⁽³⁰⁾
- Intensity of the thoughts disappear in the long practice and one gets relaxation, calmness, lightness and pleasant feelings and wishes to continue त्राटक (trāṭaka) with these feelings.⁽³¹⁾
- त्राटक (trāṭaka) gives improved sleep pattern, more balanced state of mind and emotional
- stability.⁽²²⁾
- Practice of त्राटक (trāṭaka) also improves memory.⁽²²⁾

2.6.3 Nervous system – Brain waves

- Alpha waves are often seen in a relaxed individual with closed eyes. Normally the alpha rhythm is blocked when the eyes are opened.⁽²⁹⁾
- During त्राटक (trāṭaka) alpha activity was not only persisted but also increased slightly. The visual stimuli could not block the alpha rhythm as they became less sensitive to the external stimulation.⁽²⁹⁾
- The increase in alpha activity is an indication of pleasant mood, less mental disturbance, absorptive, high state of one pointed - ness and no fluctuation of ideas or thrust in the mind of the practitioners.⁽²⁹⁾

2.6.4 Sympathetic and Parasympathetic Nervous system

- A shift of autonomic balance from sympathetic to parasympathetic predominance was indicated and diminution in central activity shuts out the inner and outer worlds of the practitioner and keeps in a state of alert awareness, which may lead to higher state in yoga.⁽³¹⁾

2.6.5 Mental health

- Steadiness of gaze is directly related to steadiness and concentration of mind.⁽³²⁾
- The relaxed mind needs less time and the disturbed mind needs more time to complete त्राटक (trāṭaka).⁽³²⁾

2.6.6 Visual Perception

- The unconscious mind stimulates specific bio-electrical reactions according to the type of the visuals perceived by it. These reactions affect the entire body.⁽³⁷⁾
- An increase in the Critical flicker fusion is seen immediately after the practice of त्राटक (trāṭaka).^(38, 40)

2.6.7 Physical

- त्राटक (trāṭaka) exercises and strengthens eye muscles.⁽³⁴⁾
- त्राटक (trāṭaka) vitalises vision.⁽²⁶⁾
- Practice of त्राटक (trāṭaka) also destroys microbes through tears.⁽²⁴⁾
- Practitioner gets a soothing affect to the cranial nerves.⁽²⁷⁾

2.6.8 Therapeutic

- त्राटक (trāṭaka) is known to correct refractive errors.⁽³⁴⁾
- Beneficial in relieving nervous tension.⁽²⁸⁾
- People with anxiety and Insomnia benefits greatly.⁽²⁵⁾
- Many of the eye disorders are due to lack of proper blood circulation. So, त्राटक (trāṭaka) helps in improving circulation and overcoming eye disorders related to blood circulation.⁽³⁴⁾
- त्राटक (trāṭaka) brings a balance in the nervous system.⁽³⁶⁾

2.7 Comparison and Similarities between त्राटक (trāṭaka) and ध्यान (dhyāna)

	त्राटक (trāṭaka)	Meditation ध्यान (dhyāna)
1. <u>Similarities</u>		
a. The seat (steady posture)	is necessary	is necessary
b. Looking at one point	is present	is present
2. <u>Differences</u>		
a. The main organ involved in spiritual practice	the eye	the mind
b. Discomfort to the eyes	is present	is present
c. Blinking	is to be avoided	may occur initially, does not occur later
d. The object of concentration	1) is mostly gross 2) is steady	is gross or subtle is steady or in rhythmic motion
e. Emotions	are absent	may be present e.g. when meditating on an idol of a deity
f. Dissolution of the mind	does not occur	Occurs ⁽³⁵⁾

CHAPTER 3

SUMMARY

Summary

- The practice of त्राटक (trāṭaka) is very simple which involves gazing at a particular object without blinking the eyes till the eyes start rolling with tears.
- त्राटक (trāṭaka) is basically divided into two categories internal त्राटक (trāṭaka) and external त्राटक (trāṭaka).
- Internal त्राटक (trāṭaka) is an advancement where the object is visualised mentally and external त्राटक (trāṭaka) involves gazing at the object directly.
- Based on the object both internal and external त्राटक (trāṭaka) are further divided into different types of त्राटक (trāṭaka).
- Scriptures say त्राटक (trāṭaka) should be protected like a pot of gold.
- Though the scriptures talk about the greatness and benefits of त्राटक (trāṭaka) on the other hand the same scriptures insist that त्राटक (trāṭaka) should be done under the guidance of guru.
- All the precautions and guidelines should be respected.
- Practitioners should carefully understand that the practice of त्राटक (trāṭaka) is different from meditation even though there are some similarities between them.
- Regular practice and calm approach towards the practice of त्राटक (trāṭaka) yields good result.⁽³²⁾

PART – 2

EFFICACY OF *TRATAKA* ON ATTENTION IN CHILDREN

CHAPTER 1

INTRODUCTION

त्राटक (trāṭaka) is an ancient yogic technique which comes under one of the shat क्रिया (kriyā) (Yogic purification techniques). The yogic scriptures say त्राटक (trāṭaka) is a practice of gazing at an object without blinking the eyelids till tears starts rolling. Traditionally it is described that the practice of त्राटक (trāṭaka) helps the practitioner to develop clairvoyance, overcomes mental tensions, and develops aura viewing capability.⁽³²⁾

त्राटक (trāṭaka) has been used of as a tool for developing focussed attention and prepare oneself for meditation. त्राटक (trāṭaka) has been traditionally described to internalise the awareness and trains the practitioner to ignore other sensory inputs. Hence, attempts were made to understand the influence of त्राटक (trāṭaka) on visual perception.

In an earlier study, young adults between the ages 18 – 42 were studied in two aspects of त्राटक (trāṭaka). The degree of optical illusion was measured before and after a month during which they practiced त्राटक (trāṭaka) as focussing and de-focussing. The results suggested that there was a significant reduction (86%) in the degree of illusion in त्राटक (trāṭaka) group while the control group which continued with the daily routine without त्राटक (trāṭaka) showed no change.⁽⁴³⁾

A recent research work done on त्राटक (trāṭaka) in thirty subjects (15 were male) with mean age and standard deviation as 31.33 ± 4.67 years. Each participant did त्राटक (trāṭaka) and the control session on consecutive days, at the same time of the day (late evening for everyone). The critical Flicker Fusion Frequency (CFF, a measure of visual perceptual sensitivity) was recorded before and immediately after the practice of त्राटक (trāṭaka). The results showed a statistically significant increase in Flicker Fusion Frequency from 37.35 ± 2.84 to

38.66 ± 2.91 after the practice of त्राटक (trāṭaka). The control session did not produce a statistically significant change in the CFF. ⁽³⁸⁾

While the above mentioned studies looked at the influence of त्राटक (trāṭaka) on visual perception in young adults, another study assessed the influence of त्राटक (trāṭaka) (as part of a one hour yoga program) on CFF in school children. It was evident that the Yoga group (including त्राटक (trāṭaka)) produced significant improvements in Flicker Fusion Frequency while a no yoga control group showed no change. ⁽⁴⁴⁾

Since attention plays a major in the process of perception, the present study hypothesized that the practice of त्राटक (trāṭaka) has a positive influence on the process of attention. Also, understanding the benefits of त्राटक (trāṭaka) in terms of improving attention would facilitate its use in augmenting scholastic performance in school children.

Use of a six letter cancellation test (SLCT) provides a simple neuro-psychological method to assess visual perception based on attention. It was speculated that SLCT determines the capacity for attention, concentration, visual scanning and rapid response activation and inhibition. ⁽⁴⁵⁾

Hence, the present study has been designed to evaluate the influence of one month of regular त्राटक (trāṭaka) practice on the attention span in school children.

CHAPTER 2

Aims and Objectives

2.1 Aim

To study the efficacy of त्राटक (trāṭaka) on attention in children.

2.2 Objectives

To study the changes in performance of a task requiring attention (Six Letter Cancellation Test) following the practice of त्राटक (trāṭaka) compared to no intervention control group.

2.3 Hypothesis

त्राटक (trāṭaka) would increase attention in school children.

2.4 Null Hypothesis

त्राटक (trāṭaka) would not increase attention in school children.

CHAPTER 3

METHODOLOGY

3.1 SUBJECTS

3.2 DESIGN

3.3 VARIABLES

3.4 DATA EXTRACTION

3.5 INTERVENTION

3.1 Subjects

3.1.1 Sample Size

School children between the age group of 8-13 years are taken for the study. The sample size of the present study was 63 male and female children. The subjects were randomly allocated to experimental and control groups using a random number table. Hence there were 32 subjects in the त्राटक (trāṭaka) group and 31 subjects are in the control group.

3.2 Sources of the Subjects

Subjects were children recruited at Visakhapatnam from a school named Sri Prakash Educational Institution.

3.3 Inclusion Criteria

- Students who are regular in classes.
- Subjects who would understand instructions given in English.
- Age group between 8-13 years.
- Motivation to practice and willingness to volunteer for the study.

3.4 Exclusion Criteria

- Presence of optical disorders based on a clinical examination.
- Students finding difficulty for adaptation to practice.

3.5 Ethical Consideration

- Subject's parents /guardians were explained about study in detail and their signed informed consent was obtained.

3.6 Design of study

- Present study was a Randomised Control Trial Pre-Post Design.
- Subjects were assessed on day 1 and on Day 40.

Yoga group

PRE (Day 1)	त्राटक (trāṭaka) Practice	POST (Day 40)
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PRE (Day 1)	No Intervention	POST (Day 40)
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Control group

3.7 Assessments

- Six letter cancellation test was administered on 1st day and again taken after 40th day after giving intervention for yoga group and no intervention in case of control group.

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 were asked to cancel as many target alphabets as possible in the specified time of 90 seconds. Subjects were allowed to do letter cancellation in a horizontal, vertical or randomized manner by selecting a particular key

letter. The total number of cancellations and wrong are scored. The net score for each individual under different experimental conditions will be recorded.

3.8 Intervention

3.8.1 Module of intervention for yoga group⁽⁴¹⁾

Practice.	Explanation.	Duration.
Prayer.	<i>Om</i> kara chanting three times in three breaths.	One minute.
Horizontal movement of eyeballs.	Horizontal movement of Eyeballs from extreme left corner of eye to the extreme corner on the right and tracing back to the left constitutes one round. Five to ten rounds is repeated as slow as possible without blinking, care should be taken by the practitioner in avoiding undue strain at all levels and except eyeballs rest of the body should be stable. Once done eyes are closed gently and practitioner should feel the changes taking place.	Two minutes.
Vertical movement of eyeballs.	Vertical movement of eyeballs from extreme top view to the extreme down view and tracing back to top constitutes one round; such rounds are repeated five to ten times as slow as possible avoiding blinking of eyes and keeping whole body stable. Practitioner should take care in retaining calmness in the mind and body. Once done eyes are closed gently and practitioner should feel the changes taking place.	Two minutes.
Simple Palming.	Both the palms are rubbed one against each other vigorously to create heat and प्राण (prāna) then, then palms are to be placed over the sockets of eye balls without touching the eyeballs and the eyes are allowed to relax with the warmth from palms. Care should be taken that no pressure is applied over the sockets, palms should be placed softly. Awareness of stimulated eyeballs slowly getting	One minute.

	relaxed. Once done eyes are kept closed and palms are rested over legs.	
Diagonal one movement of eyeballs.	Practitioner should move his gaze diagonally from the extreme corner of eyes on the right top side towards extreme corner on the left down side and should be traced back to the corner on the right top side this is one round and such rounds are repeated for five to ten times as slow as possible without blinking the eyes. Once the repetition of rounds is finished eyes are smoothly closed and self should witness the changes taking place at all levels.	Two minutes.
Diagonal two movement of eye balls.	Now the practitioner should shift the gaze from extreme corner of eye on left top side to the extreme corner on the right down side and the path of gaze is traced back to the corner of eye on the left top side. Such rounds are repeated for five to ten times as slow as possible avoiding blinking and undue strain. After the completion eyes should be closed very gently and practitioner should watch the changes taking place.	Two minutes.
Press and release palming.	Palms are rubbed one against each other and warmth is generated over the surface of the palms. Then the palms are placed in a cup shaped carefully over the sockets of the eyes without touching the eyes so that no light is entering into the eyes. Now pressure is applied as practitioner goes for an inhalation by the palms over the sockets of eyeballs without touching the eyeballs and pressure is released as the practitioner goes for the exhalation making sure that just the pressure of the palms over the sockets is released and the contact with the palms is retained. Process is repeated for five times synchronizing with the breathing and then palms are rested over the knees keeping eyes closed.	One minute.
Clockwise movement of the eyeballs.	Practitioner should now move the gaze in a circular manner in clockwise direction exploring the biggest circumference as slow as possible avoiding undue strain and blinking.	Two minutes.

	When the eye ball gaze reaches to the starting point it is considered as on round such rounds are repeated for five to ten times then the eyes are closed. Awareness watching the changes happening at all levels.	
Anti-clockwise movement of eyeballs.	Practitioner should now move the gaze in a circular manner in anti-clockwise direction exploring the biggest circumference as slow as possible avoiding undue strain and blinking. When the eye ball gaze reaches to the starting point it is considered as on round such rounds are repeated for five to ten times then the eyes are closed. Awareness watching the changes happening at all levels.	Two minutes.
Constant pressure palming	Palms are rubbed one against each other and warmth is generated over the surface of the palms. Then the palms are placed in a cup shaped carefully over the sockets of the eyes without touching the eyes so that no light is entering into the eyes. Now pressure is applied as practitioner goes for an inhalation by the palms over the sockets of eyeballs without touching the eyeballs and the pressure is continued to be retained with long deep effortless breathing utilizing full lung capacity with total awareness of the practice and after five cycles of breathing eyes are kept closed softly and palms are rested over knees.	One minute.
Simple gazing.	Practitioner should slowly open eyes and if necessary eyes are blinked once or twice but the gaze should be facing down to the ground and then the gaze is slowly shifted without blinking towards the candle flame which is two meters away right in front at the eye level the gaze is fixed over the flame softly without blinking after a minute or two when the practitioner starts rolling with tears or finding difficult to keep eyes opened then the eyes are closed softly. Total awareness of the changes taking place should be witnessed.	Five minutes.
Press and	Palms are rubbed one against each other and warmth is	One minute.

release palming.	generated over the surface of the palms. Then the palms are placed in a cup shaped carefully over the sockets of the eyes without touching the eyes so that no light is entering into the eyes. Now pressure is applied as practitioner goes for an inhalation by the palms over the sockets of eyeballs without touching the eyeballs and pressure is released as the practitioner goes for the exhalation making sure that just the pressure of the palms over the sockets is released and the contact with the palms is retained. Process is repeated for five times synchronizing with the breathing and then palms are rested over the knees keeping eyes closed.	
Intense focusing.	Practitioner should slowly open eyes and if necessary eyes are blinked once or twice but the gaze should be facing down to the ground and then the gaze is slowly shifted without blinking towards the candle flame which is two meters away right in front at the eye level. Now effort is drawn into action in order to focus intensely at the wick of the flame avoiding undue strain. Once the tears starts rolling or when it's difficult to keep eyes opened then the eyes are closed softly. Total awareness of the changes taking place should be witnessed.	Five minutes.
Constant pressure palming	Palms are rubbed one against each other and warmth is generated over the surface of the palms. Then the palms are placed in a cup shaped carefully over the sockets of the eyes without touching the eyes so that no light is entering into the eyes. Now pressure is applied as practitioner goes for an inhalation by the palms over the sockets of eyeballs without touching the eyeballs and the pressure is continued to be retained with long deep effortless breathing utilizing full lung capacity with total awareness of the practice and after five cycles of breathing eyes are kept closed softly and palms are rested over knees.	One minute.
De-focusing	Practitioner should slowly open eyes and if necessary eyes	Five

	<p>are blinked once or twice but the gaze should be facing down to the ground and then the gaze is slowly shifted without blinking towards the candle flame which is two meters away right in front at the eye level the gaze is fixed over the flame softly without blinking. Central vision is placed over the flame and with the help of peripheral vision the awareness and vision is expanded exploring the details of the flame like colors, aura, light particles emanating, light spreading, then without blinking further continue to expand awareness to the objects and people around if possible with peripheral vision expanding vision in all directions without moving eyeballs then the awareness should be gradually moved to the entire cosmos and same way it is brought back to the flame then all the details of the flame are memorized and eyes are closed softly. Now the flame is visualized at eyebrow centre and it is retained as long as possible. Slowly when the vision of the flame vanish the mind completely diffuses into silence.</p>	minutes.
<p>Constant pressure palming with भ्रामरि (bhrāmari)</p>	<p>Palms are rubbed one against each other and warmth is generated over the surface of the palms. Then the palms are placed in a cup shaped carefully over the sockets of the eyes without touching the eyes so that no light is entering into the eyes. Now pressure is applied as practitioner goes for an inhalation by the palms over the sockets of eyeballs without touching the eyeballs and the pressure is continued instead of exhalation ‘M’ kara is chanted with closed mouth creating beautiful resonance of vibrations. These chanting are repeated for three to five times allowing every chant to end into a silence without attempting to extend the chant. Once done eyes are kept closed and palms are rested over knees.</p>	One minute.
<p>Closing</p>	<p>Adapting नमस्कार (namaskāra) मुद्रा (mudrā) chanting one</p>	Two minutes.

	ओंकार (omkāra) and three शान्ति (śānti) in a single breathe followed by silence.	
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3.8.2 Intervention for the control group

Subjects of the control group were asked to continue with their normal routine. They were not given any additional intervention, but they were allowed to continue with the regular physical exercise and other school based activities.

3.9 Data Extraction.

The total number of cancellations made and wrong cancellations were scored. The net score was obtained by deducting wrong cancellations from the total cancellations attempted. The scoring was done by the experimenter who was unaware of the names of the subjects to whom the data sheets belonged to. This ensured masking of the data while doing the data extraction.

3.10 Data Analysis.

Data was analyzed using SPSS 10. A repeated measure ANOVA was used with one within subjects factor (pre and post) and one between subjects factor (groups i.e., yoga and control). Post hoc analysis was done with bonferroni adjustment for multiple comparisons between the mean values.

CHAPTER 4

RESULTS

4.0 RESULTS

4.1 TABLE

4.2 GRAPH

4.0 Results

The present randomised control trial assessed 32 subjects belonging to yoga group and 31 subjects belonging to control group before and after 40 days of intervention.

The Net scores calculated by deducting the wrong cancellations made from the total attempts made. The Data were analysed Using SPSS version 10. Which has shown a significance growth from pre to post in yoga group ($P < .0001$).

4.1 Table

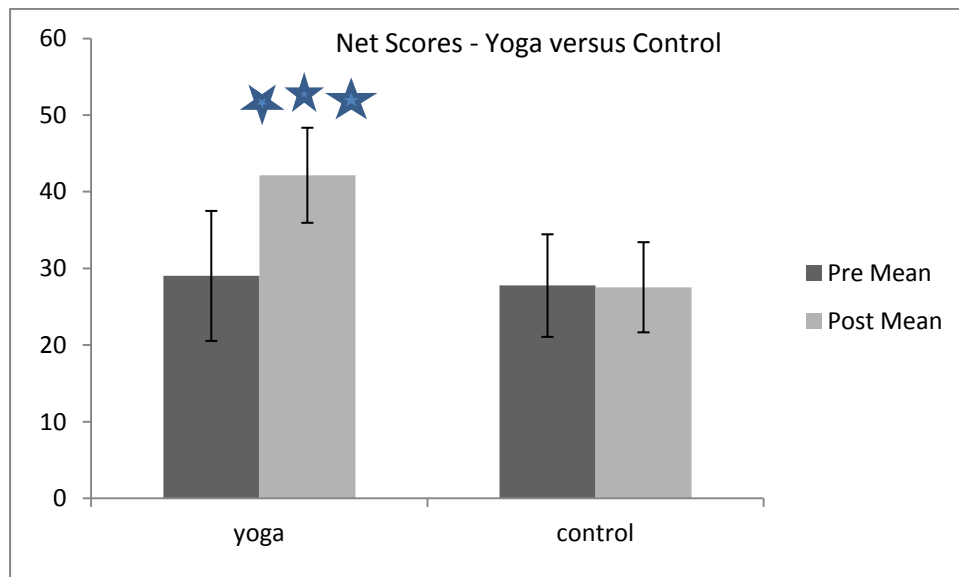
- The following table shows the means of pre data and post data of both yoga and control group and the percentage of change in the total attempts made, wrong attempts made and the net score.

	Yoga group			Control group		
	Pre	Post	% of change	Pre	post	% of change
Total attempted	29.09 ±8.54	42.22*** ±6.20	45.14	27.77 ±6.69	27.55 ±5.88	-0.79
Wrongly attempted	0.06 ±0.25	0.06 ±0.25	0.00	0.00 ±0.00	0.00 ±0.00	0.00
Net score	29.03 ±8.48	42.16*** ±6.20	45.23	27.77 ±6.69	27.55 ±5.88	-0.79

*** $p < .001$, Comparing the Post values with the Pre using Post hoc analysis with Bonferroni adjustment.

4.2 Graph

- Graph was plotted between means of pre net score and post net score of both control group and yoga group. The bar graph clearly shows the improvement in the net score of yoga group after intervention with a significance of $P < .0001$.



*** $p < .001$, Comparing the Post values with the Pre using Post hoc analysis with Bonferroni adjustment.

CHAPTER 5

DISCUSSION

The present study was aimed assessing the efficacy of त्राटक (trāṭaka) on children's attention. 63 subjects including both male and female were randomly divided into two groups. After 40 days of training in त्राटक (trāṭaka) there was a significant increase in the net scores derived from a six letter cancellation test. The control group showed no change.

It is evident from the earlier studies that त्राटक (trāṭaka) has a definitive influence on human perception and performance. The critical flicker fusion frequency is the most studied variable with respect visual perceptual sensitivity and त्राटक (trāṭaka). A previous study in school children suggested that 10 days of Yoga practice (including the practice of त्राटक (trāṭaka) has brought about significant improvements in CFF⁽⁴⁴⁾. Recently, similar attempts were made to understand the influence of त्राटक (trāṭaka) on CFF, but in young adults. Thirty subjects participated in a study where they were evaluated for the CFF immediately before and after the practice. There was a significant increase in CFF from 37.35 ± 2.84 to 38.66 ± 2.91 after the yoga practice of त्राटक (trāṭaka).⁽³⁸⁾

It was speculated that त्राटक (trāṭaka) induces focussed attention and improves visual perceptual sensitivity. However, the use of त्राटक (trāṭaka) in improving attention span was not investigated objectively.

Attention is the ability to direct cognitive ability on a specific stimuli to complete the task. Mind is always driven away by the senses. In त्राटक (trāṭaka), the mind is conquered by stilling the senses. Once the mind is conquered the cognitive ability can be focused easily on a specific stimulus. At neuro-physiological level practice of meditation has shown to activate some specific centres on brain like anterior cingulate, frontal lobe and hippocampus, which are involved in the process of attention.⁽²⁾

Series of experiments conducted on a movement related meditation technique (Cyclic Meditation) also showed positive changes in attention.^(47, 48) A single study conducted in 208

school students, (132 boys and 76 girls) in the age range of 13 - 16 years showed a significant increase in the total and net scores following CM compared to Supine rest.⁽⁴⁶⁾

The present study was conducted to understand the influence of त्राटक (trāṭaka) on children's attention as an attempt to identify the most appropriate yoga technique which can influence attention directly. त्राटक (trāṭaka) has been traditionally described as the practice of choice for internalising awareness, a practice to help an individual ignore unwanted sensory inputs and attend to those of his/her choice.⁽³⁶⁾ Hence, the present study used त्राटक (trāṭaka) as the intervention, while there was an earlier study on CM reporting positive changes. As speculated त्राटक (trāṭaka) showed better performance (45.23%) in a letter cancellation task as compared to a previous study on CM (14.5%) or Supine rest (11.3%).

The changes seen following त्राटक (trāṭaka) can be attributed to improved perception, ability to focus for a longer duration and its inherent feature of associated relaxation. Future studies are required to explore the underlying mechanisms.

CHAPTER 6

APPRAISAL

6.1 SUMMARY

6.2 CONCLUSION

6.3 LIMITATIONS

6.4 STRENGTH

6.5 FUTURE STUDIES

6.1 Summary

- त्राटक (trāṭaka) is a practice of gazing at any particular object without blinking for a period of time till the eyes starts rolling with tears where care should be taken to avoid undue strain.
- Its greatness is vastly said in the scriptures but the science has to explore much more to prove them.
- त्राटक (trāṭaka) is a practice where one has to definitely concentrate to achieve success, same time the concentration, attention, Etc are also exercised improving all the factors that are involved in the practice.
- Though some minimal research is done on त्राटक (trāṭaka), care should be taken during the practice.
- Always guidance of a well known master advisable.
- The guidelines involved in the practice should be respected. ⁽³²⁾
- Practising त्राटक (trāṭaka) six days a week for 40 days shows a significant improvement in attention among children.

6.2 Conclusion

Practice of त्राटक (trāṭaka) improved the ability to focus and sustain attention in school children.

6.3 Limitations

- The present study is done with low sample size.
- The later effects are not monitored.
- Subjects are not under residential program which can be influenced by confounding variables.

6.4 Strength

- Randomised control study is a very good way to avoid errors, bias Etc.
- Significant increase in the children's attention is shown in the yoga group.

6.5 Future studies.

- As the present study is done with fewer subjects and the later effects are not monitored, it would be interesting conduct research similar study with much larger sample size with later effects also monitored. Also, use of more objective measurement tools to understand the influence of त्राटक (trāṭaka) on attentional processes is highly recommended.

CHAPTER 7

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APPENDIX

RAW DATA

YOGA GROUP

S.No	Name	Age	Sex	Pre Total	Pre Wrong	Pre Net	Post Total	Post Wrong	Post Net
1	Nagraj Shetty	13	M	43	0	43	38	0	38
2	Cheryl D'Souza	12	F	36	0	36	49	1	48
3	Unnisa Begum	12	F	34	0	34	50	0	50
4	L.Sanjana	11	F	30	0	30	40	0	40
5	K.Appala Reddy	9	M	34	0	34	38	1	37
	Guru Sharan								
6	Singh	13	M	42	0	42	52	0	52
	Jai Kumar								
7	Reddy	13	M	48	0	48	50	0	50
	Kranthi Kiran								
8	Roy	12	M	45	1	44	54	0	54
9	M.Amitha	12	F	34	0	34	41	0	41
10	G.Sunitha	9	F	35	0	35	47	0	47
	Peerupally								
11	Ashish	12	M	29	0	29	49	0	49
	Sravani								
12	Nanapaneni	12	F	29	0	29	44	0	44
13	Anshit Baxi	13	M	28	0	28	37	0	37
	Chitragada								
14	Singh	13	F	26	0	26	43	0	43
15	Shreya Gada	12	F	31	0	31	33	0	33
16	Kruti	11	F	34	0	34	42	0	42
17	Ruchira Menon	13	F	30	0	30	47	0	47
	Gautam								
18	Yarlagadda	12	M	31	0	31	45	0	45

19	Suresh Varma	9	M	28	0	28	43	0	43
20	Ram Naresh	12	M	29	0	29	27	0	27
21	Harish Idnani	12	M	30	0	30	49	0	49
22	Varsha .J	9	F	20	0	20	44	0	44
23	Padmini Rathod	9	F	30	1	29	39	0	39
24	Vishal .G	12	M	29	0	29	43	0	43
25	Jayadev	11	M	19	0	19	40	0	40
	Ravi Kiran								
26	Choudary	13	M	23	0	23	40	0	40
	Chandini								
27	Battula	12	F	20	0	20	42	0	42
28	Lavanya .P	12	F	13	0	13	39	0	39
29	Karthik .L	11	M	16	0	16	34	0	34
30	Divya .K	17	F	17	0	17	42	0	42
31	Swati .N	10	F	20	0	20	40	0	40
32	B.Ravi Kumar	10	M	18	0	18	30	0	30

CONTROL GROUP

S.No	Name	Age	Sex	Pre Total	Pre Wrong	Pre Net	Post Total	Post Wrong	Post Net
1	Ashwini .M.A	10	F	22	0	22	21	0	21
2	E.Venkatesh	11	M	18	0	18	22	0	22
3	D.V.Avinash	10	M	23	0	23	21	0	21
4	C.H.Avinash	12	M	17	0	17	17	0	17
5	Ramya Kosana	13	F	13	0	13	19	0	19
6	Vivekananda .R	11	M	16	0	16	19	0	19
7	Mrudula Uriti	9	F	20	0	20	21	0	21
	Ashutosh								
8	Mukherjee	12	M	22	0	22	19	0	19
9	Sindhura Alluri	11	F	30	0	30	34	0	34

10	Vivek Jasti	11	M	29	0	29	32	0	32
11	Allu Vivek	11	M	34	0	34	30	0	30
12	Jyostna Karri	11	F	36	0	36	27	0	27
13	Alekhya .T	9	F	34	0	34	28	0	28
14	Padmaja Gurram	10	F	28	0	28	27	0	27
15	Reknath .C	12	M	31	0	31	27	0	27
16	Alka Pinto	12	F	36	0	36	34	0	34
	Sarveshwar								
17	Reddy	13	M	24	0	24	27	0	27
18	Prathap Maganti	13	M	27	0	27	28	0	28
19	Rahasya .V	11	F	27	0	27	27	0	27
20	Anarkali	12	F	27	0	27	23	0	23
	Praveen								
21	Mandapati	12	M	28	0	28	26	0	26
	Praveen								
22	Lakkimisetty	12	M	25	0	25	26	0	26
23	Anusha .K	11	F	25	0	25	28	0	28
24	Preethi Catherine	12	F	26	0	26	26	0	26
25	Bob Dylan	13	M	36	0	36	37	0	37
26	Ramcharan	11	M	38	0	38	34	0	34
27	Sushanth .A.K	12	M	35	0	35	36	0	36
28	Aparanji .M	11	F	35	0	35	35	0	35
29	Kaarunya .Y	12	M	32	0	32	33	0	33
30	K.Bala Ganesh	12	M	34	0	34	33	0	33
31	Y.Ramtej	13	M	33	0	33	37	0	37

