

## CHAPTER FIVE

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## 5. METHODS

### 5.1 PARTICIPANTS

#### 5.1.1: SAMPLE SIZE:

The sample size was calculated by Using G\*Power Software by statistical analysis with the effect size of 0.87,  $\alpha$  level at 0.05, and power at 0.95, this effect size was obtained from using the mean & standard deviation of the hip circumferences from our pilot study. (Rathi, Nagarathna, R., Nagendra, & Tekur, 2019). Based on this study the calculated sample size is 40 (20+20).

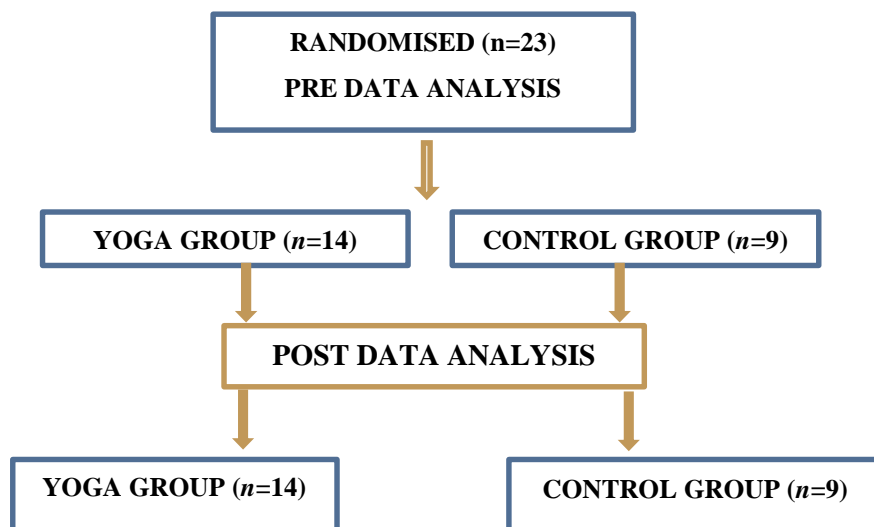
#### 5.1.2: SELECTION AND SOURCE OF PARTICIPANTS

The participants of main study were students of Dr Kalmadi Shyamrav School of Kaveri education, Pune, Maharashtra. Survey was conducted of all students of school . Screening was done of 1400 students from the age group between 11 years to 17 years. Out of 1400 student 1300 were normal & 100 students were in obese category as per BMI percentile. who were consented to participate. But 53 were enrolled for study after rejection as per inclusive criteria 25 in Yoga & 28 Control group.

#### 5.1.3: RANDOMISATION

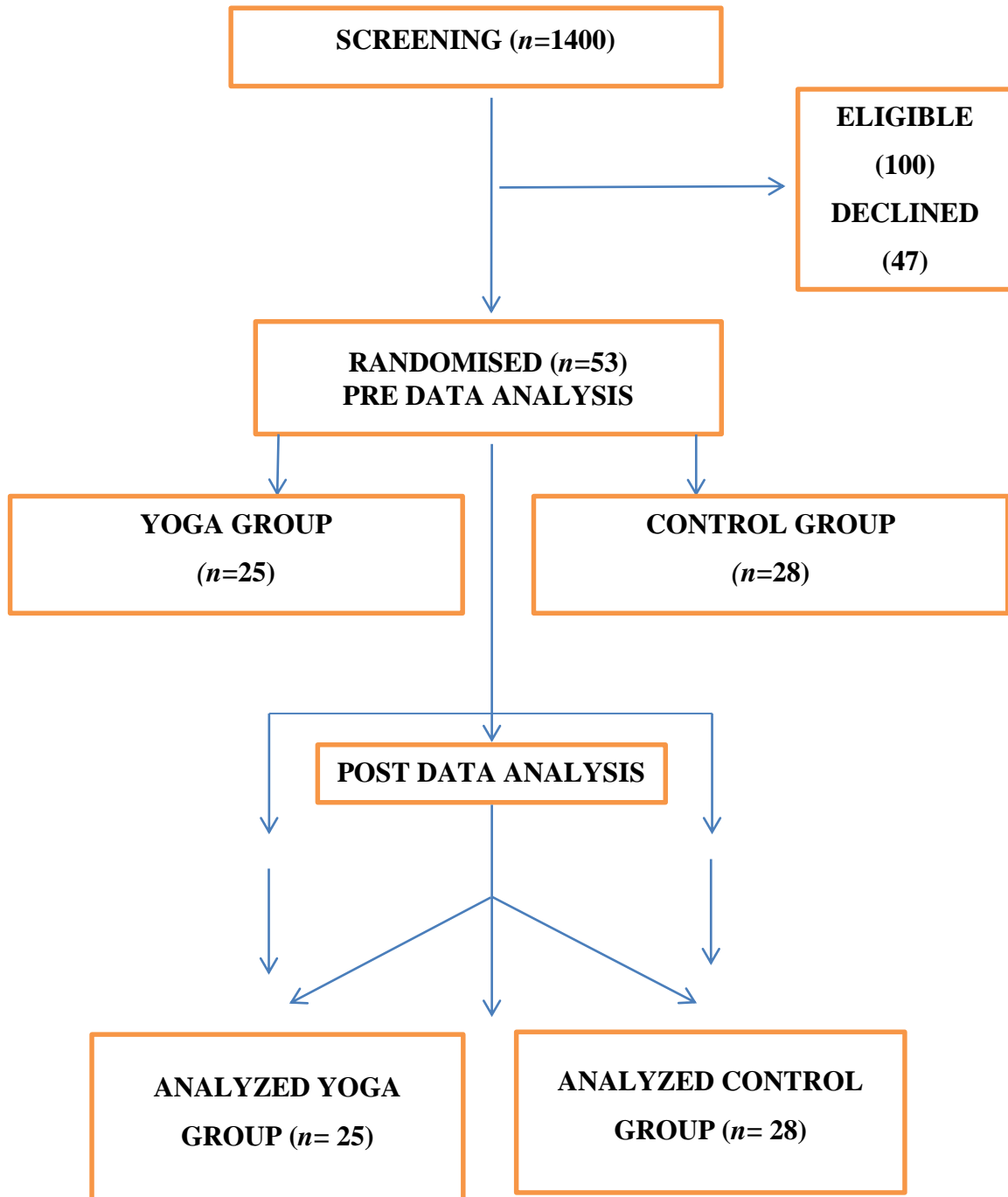
Obese & overweight were randomly assigned to two groups by using a computer-generated random number table ([www.randomizer.org](http://www.randomizer.org)) by the pre labeled sealed envelope method.

**FIGURE 5 A**  
**STUDY PROFILE PILOT STUDY ONE**



**FIGURE- 5-B**  
**STUDY PROFILE MAIN STUDY 2**

**DESIGN**



#### **5.1.4 INCLUSION CRITERIA**

- Adolescents between 11-17 years of age.
- Qualify as overweight / obese (BMI percentile > 95).
- Consent to participate in the study
- Willingness of parent or caretaker participation
- Currently not enrolled in any other weight loss program
- No experience of Yoga
- Willingness to follow instructions

#### **5.1.5. EXCLUSION CRITERIA**

- Diabetes Mellitus
- Psychiatric Disorders
- Serious Medical Condition

Associated medical conditions such as spinal injury,diabetes,pcod,heart problems, physical & mental disability.

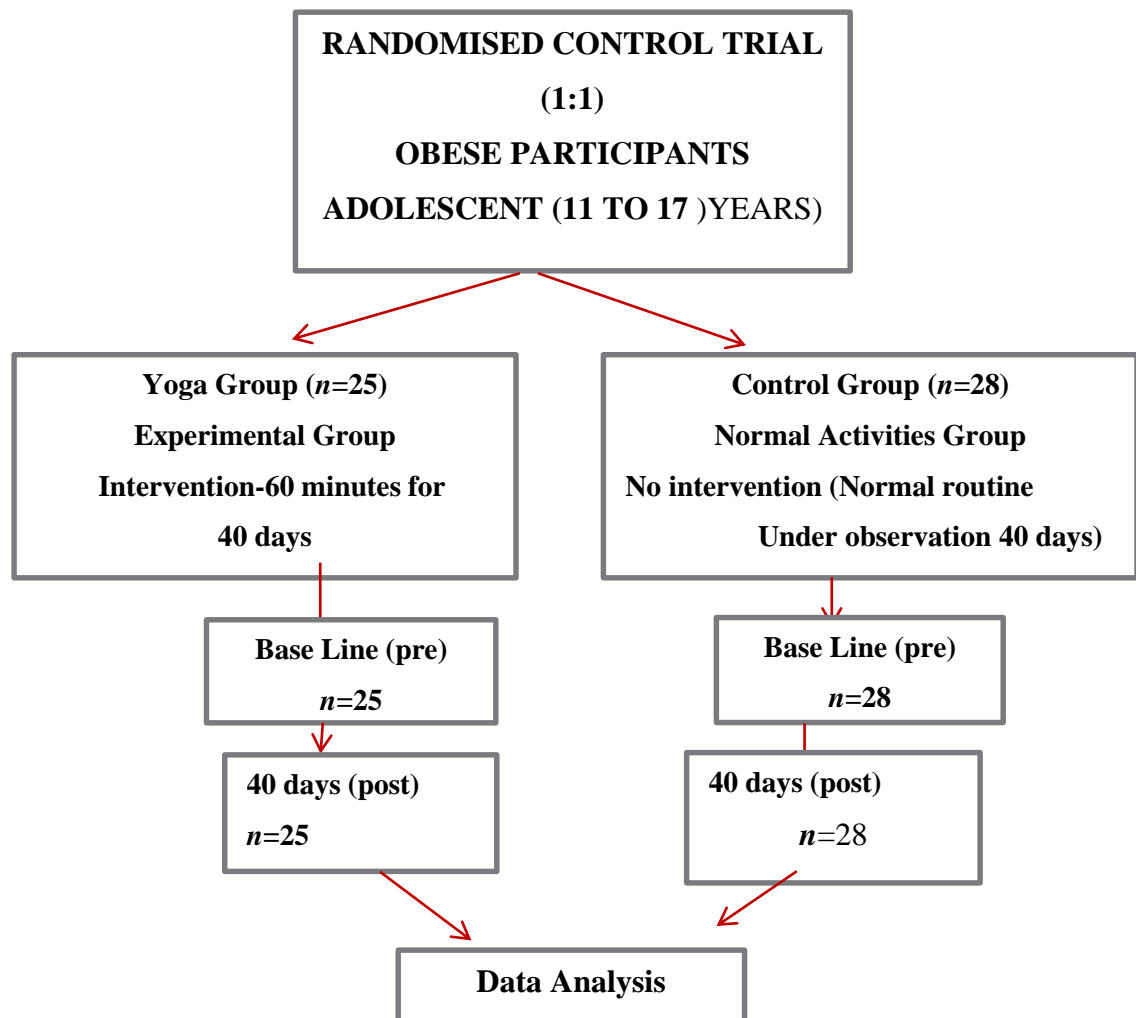
- Children on any medications for weight management
- Enrolled in any other Weight management Program
- Non-Participating Parent or Care Giver

#### **5.1.6 ETHICAL CONSIDERATION**

The approval from the Institutional Ethical Committee of S-VYASA was obtained. Informed Assent Form (IAF) from the participants, a signed informed consent form (ICF) along with Demographic data from the parents & written permission from the School authorities was obtained. The complete study has been approved by ethical committee of Swami Vivekananda Yoga Anusandhan Samsthana, Bangalore.

## 5.2 DESIGN OF THE STUDY

FIGURE-6



## 5.3 VARIABLES STUDIED

- i. Socio demographic data.
  - Age in years
  - Gender male/female
  - Educational standard
  - Demography
- **Primary Variables:**
- ii. Anthropometric measurements

- Weight (kg)
- Height (cm)
- Body Mass Index (kg/m<sup>2</sup>)
- Mid arm circumference in (cm)
- Abdominal circumference in (cm)
- Waist circumference in (cm)
- Hip circumference in (cm)
- Systolic Blood pressure in (mm/hg)
- Diastolic Blood pressure in (mm/hg)
- Pulse rate per minute

iii. BMI Parameters: BMI parameters were calculated using Body composition monitor Model HBF -701.

- Total body fat percentage
- Resting metabolism unit :ml O<sub>2</sub>/min
- Subcutaneous fat ( Whole body ) percentage
- Muscle percentage ( Whole body )
- Subcutaneous fat ( Arms ) percentage
- Muscle percentage (Arms ) percentage
- Subcutaneous fat ( Trunk ) percentage
- Muscle percentage ( Trunk )
- Subcutaneous fat ( Legs ) percentage
- Muscle percentage (Legs )

**Secondary Variables:**

iv. Physical tests

- Sit ups per minute
- Flamingo Balance test per minute

v. Psychological tests

- Body Awareness Questionnaire ( BAQ ) self reported
- Child Eating Behavior Questionnaire (CEBQ) parent report measure
- Rosenberg self - esteem Scale ( RSES ) self reported

vi. Cognitive tests

- Digit Letter Substitution test per minute
- Six Letter Cancellation Test per minute

## **Assessments:**

### **1. Total body fat percentage**

The body fat percentage (BFP) of a human or other living being is the total mass of fat divided by total body mass, multiplied by 100; body fat includes essential body fat and storage body fat. Essential body fat is necessary to maintain life and reproductive functions. The percentage of essential body fat for women is greater than that for men, due to the demands of childbearing and other hormonal functions. To calculate body fat percentage, add your waist and hip measurements, and then subtract the neck measurement to determine your circumference value.

### **2. Resting metabolism**

Resting metabolic rate (RMR) is whole-body mammal metabolism during a time period of strict and steady *resting conditions* that are defined by a combination of assumptions of physiological homeostasis and biological equilibrium. RMR differs from basal metabolic rate (BMR) because BMR measurements must meet total physiological equilibrium whereas RMR conditions of measurement can be altered and defined by the contextual limitations.

### **3. Subcutaneous fat ( whole body )**

There are three different types of fat cells in the body. It can be stored in three ways: essential, subcutaneous & visceral fat. Essential fat is necessary for a healthy, functional body. Subcutaneous fat makes up most of our bodily fat and is found under the skin. Visceral fat is adipose tissues stored in in peritoneal cavity around visera.

#### **4. Sit ups**

Sit ups are calculated by number within one minute as follows:-

Stand in the proper position. Lift your knee up in the direction of your opposite shoulder. Reach toward your knee with the opposite elbow. Twist your torso so that your knee goes to your elbow. Lower your leg back down. Repeat the same with the opposite leg.

#### **5. Flamingo Balance test**

The Flamingo Balance Test is total body balance test, and forms part of the Eurofit Testing Battery. This single leg balance test assesses the strength of the leg, pelvic, and trunk muscle as well as dynamic balance. Purpose: In this test the subject is standing on his preferred foot, bends his free leg backwards and grips the back of the foot with hand on the same side, standing like a flamingo. Time is calculated per minute for steady standing position.

#### **6. Body Awareness Questionnaire ( BAQ )**

The BAQ is an 18-item scale designed to assess self-reported attentiveness to normal none motive body processes, specifically, sensitivity to body cycles and rhythms, ability to detect small changes in normal functioning, and ability to anticipate bodily reactions.

#### **7. Child Eating Behavior Questionnaire (CEBQ)**

The Children's Eating Behavior Questionnaire (CEBQ) is a parent-report measure designed to assess variation in eating style among children. It is a parent-report measure comprised of 35 items, each rated on a five-point likert scale that ranges from never to always. It is made up of eight scales: Food responsiveness-FR, Emotional over-eating-EOE, Enjoyment of food-, EF, Desire to drink-DD, Satiety responsiveness-SR, Slowness in eating-SE, Emotional under-eating-EUE, and Food fussiness-FF. The instrument is ideal for use in research investigating the early precursors of eating disorders or obesity.

#### **8. Rosenberg self - esteem Scale ( RSES )**

The Rosenberg self-esteem scale (RSES) developed by the sociologist Morris Rosenberg. It is a self-esteem measure widely used in social-science research. It uses a



scale of 0–30 where a score less than 15 may indicate a problematic low self-esteem. The RSES is designed similar to the social-survey questionnaires. It is a ten item Likert-type scale with items answered on a four-point scale—from strongly agree to strongly disagree. Five of the items have positively worded statements and five have negatively worded ones. The scale measures state self-esteem by asking the respondents to reflect on their current feelings.

#### **9. Digit Letter Substitution test**

Digit Letter substitution test (DSST) is a neuropsychological test sensitive to brain function. The Letters have been substituted by letters from the English alphabet. Time allotted 60 seconds.

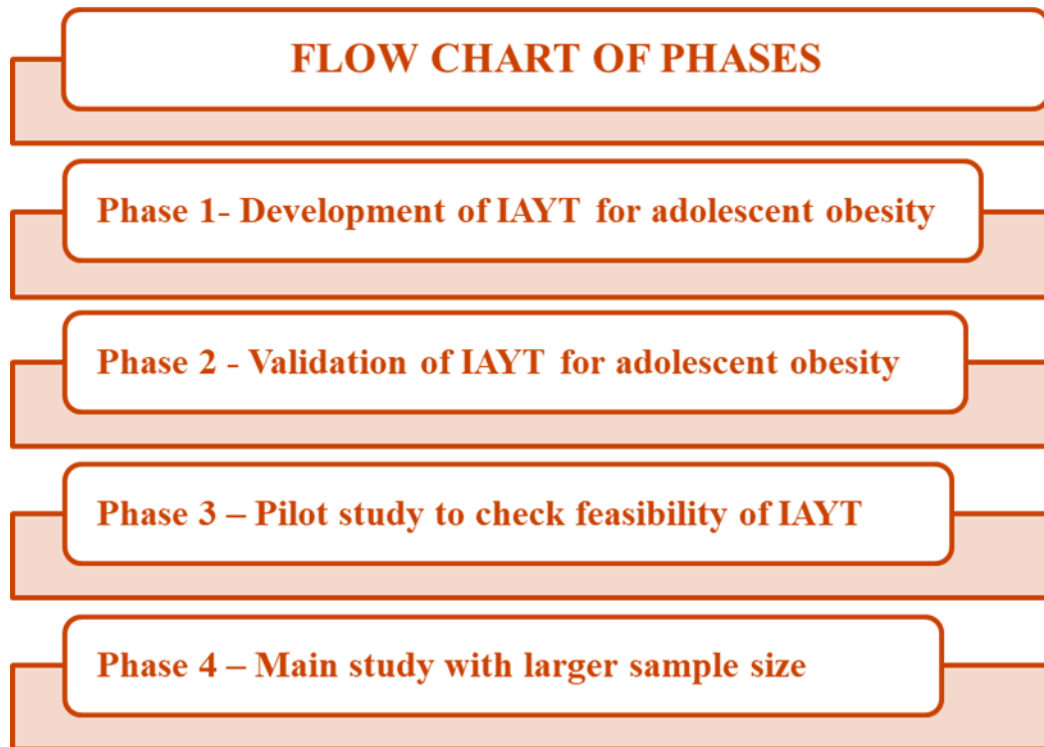
#### **10. Six Letter Cancellation Test**

The six letter cancellation task consisted of a test worksheet which specified the six target letters to be cancelled and had a 'working section' which consisted of letters of the alphabet arranged randomly in 22 rows and 14 columns. Time allotted 60 seconds.

### **5.4 INTERVENTION**

The designing, validation, and feasibility of IAYT for Obesity were carried out in the following phases:

**FIGURE: 7**  
**FLOW CHART OF PHASES OF THE DEVELOPMENT OF IAYT**  
**FOR OBESITY IN ADOLESCENTS**



**In first phase**, IAYT for Obesity was designed based on the literature review of classical texts and recently published research articles. Development of Yoga module for obesity was carried out in 3 steps.

**Step1: The reasons for obesity in adolescents.**

**TABLE 6**  
**THE REASONS FOR OBESITY IN ADOLESCENTS**

No.	THE REASONS FOR OBESITY IN ADOLESCENTS
<b>1</b>	Calorie reduction by nutritious yogic diet
<b>2</b>	Increase calorie expenditure
<b>3</b>	Specific practices to reduce fat in different parts of the body specially around hips, arms and viscera
<b>4</b>	Deep relaxation to prevent exhaustion after exercises
<b>5</b>	Detoxification to clear constipation and other endo-toxins resulting from wrong eating habits and stress
<b>6</b>	Stress management
<b>7</b>	Mind management to adhere to life style
<b>8</b>	Vital energy balance-autonomic balance
<b>9</b>	Mindfulness to achieve mastery over craving for junk food, alcohol consumption if any and enjoy eating healthy food.
<b>10</b>	Motivation to allot time for long term adherence to life style
<b>11</b>	Fun during parities to enjoy adherence

**Step 2:** The basis of IAYT to achieve these goals was understood by studying several Yoga texts by the researcher under the guidance of senior Yoga masters. This was complemented by the present day scientific understanding. We then went on to compile the corrective techniques described in many texts (*Patanjali Yoga sutras, Hath Yogapridipika, Hatharatnavali, Bhagavadgita* and others) which offer a reversibility model.

Thus a need based table of practices for long term holistic changes at all the 5 aspects of personality was prepared in Table 7.

**TABLE 7**

**BASIS FOR DEVELOPMENT OF MODULE**

Domains	Yoga Practices	Expected Benefits
<b>PANCHA KOSHA</b>		
<b>A.</b>	1.Yogic diet	1. Reduce calorie intake with wholesome nutrition
<b>Annamayakosa</b>	2.Kriyas (cleansing techniques)	2. Clear constipation
<b>Raja Yoga</b>		3.. Mastery over hunger pangs
	3. Shithileekaranavyayamas (loosening practices) and	Exercise effect of Yoga to spend calories Regulation of Pranic circulation.
	Suryanamkaskara	
	4.Asanas in standing, prone, supine and sitting positions	1. Reduces adiposity in specific parts with emphasis on abdomen, hips and arms.
		2. Trains mind to be stable and calm during stressed condition.
	5.Deep relaxation	1. Avoid exhaustion during and after the practice. 2. Improves metabolism. 3. Re-gaining and restarting efficiency of body system.
<b>B.</b>	6.Breathing exercises	1. Balances of vital energy.
<b>Prananmayakosa</b>		
	7.Breathing kriya (rapid breathing practices)	Provides detoxification effect. Breathing in names of animals offers fun for adherence.
	8.Pranayama (Slow breathing practices)	Economizes the expenditure of vital force - to achieve mastery with awareness over Pranaflows.
<b>C. 1.</b>	9.Practices of Dharana followed by Dhyana	Provides mastery over cravings for junk foods and binge eating habits.
		Increases mindful eating.
<b>Manomayakosa</b>		
<b>Raja Yoga</b>		
<b>C. 2</b>	10.Om meditation	1. Reduces Stress.
<b>Manomayakosa</b>	11. Yogic counseling using concepts of pure love to the divine.	1. Provides catharsis by cognizing the suppressed emotions. 2. Emphasizes the faith in reality. 3. Provide guidance in conflictions in mind.
<b>Bhakti Yoga</b>		
	12. Singing devotional songs.	1. Emotion culture through fun and devotion.
<b>D.</b>	13.Yogic counseling and lectures using concepts of Jnana Yoga –	Gives right knowledge to achieve the required targets.
<b>Vignanamayakosha</b>		
	i. Happiness analysis	
	ii. Sweet meditation	Enjoy eating healthy food
<b>E.</b>	14.Yogic counselling and interactive lectures using concepts of Karma Yoga - Enjoy each moment of life by counting blessings	Teaches sense of duty in each act. Maintain awareness under all circumstances.
<b>Anandamaya kosha</b>		
	15. Work in blissful awareness of self-existence.	1. Make to face exams without stress and fear.

**REFERENCE: Yoga philosophy teaches that the individual spirit or atman operates through five bodies or sheaths called the pancha kosha. this concept, explained in the taittiriya Upanishad as explained in our text yoga for the promotion of positive health (R,Nagarathna, & H,Nagendra, 2014).**

Publications, books and published articles on Yoga for obesity were also reviewed to prepare the list of all practices used in all these studies. This yielded forty practice items that were tabulated in table 8.

**TABLE 8**  
**SHOWS THE LIST OF 54 ITEMS THAT EVOLVED**  
**ALL GROUPS OF PRACTICES.**

Domain	Type of Practice	Name of Practice	CVR
Annamayakosa			Approved
Raja Yoga	1:Diet	Yogic Diet	in FGD
		Fasting	
	2:Kriya	Jalaneti	0.34
		Sutra neti	0.26
		Vamandhouti	0.6
		Laghushankhaprakshalana	0.73
		Trataka	0.43
		Kapalabhati	0.875
	3:Shithileekaranavyayamas (loosening practices)	Jogging with jumping : backward, forward and side with Mukhadhouti	0.875
		Backward and Forward Bending ( Pashchaata Purstaatanamana )	0.625
		Side Bending ( ParshvaNamana / ParshvaKarshana )	0.75
	4:Suryanamaskara	Back Swing ( Prushtha Andolana )	0.75
		Hip twist ( NitambaVyavartana )	-0.75
		Hip Rotation ( Nitambachankramana)	0.5
		Spinal Stretch with folded legs (Baddhapaadamerudandaprasaarana )	0.875
		Bhunaman	0.75
		Chakkichalana Stretch	0.5
		Butterfly	0.75
		Tiger-Stretch	0.625
		(Vyaghraprasaarana )	
		Dhanurasana and Dhanurasana Swing	1
		Surya Namaskara	0.875
		( 5 dynamic and 1 slow )	
	5::Asanas in standing , prone, supine and sitting positions	Ardha Kati Chakrasana	0.625
		Padottanasana	0.25
		Trikonasana	0.875
		Parivrittatrikonasana	0.5
		Vajarasana	0.75
		Ushtrasana	1
		Sasankasana	0.75
		Vakrasana	0.5
		Bhujangasana	1
		Shalabhasana	0.875
		Naukasana	0.75
	6:Deep relaxation	QRT ( Sheeghrashaitilyatantra )	0.75

TABLE-8: CONTD. SHOWS THE LIST OF 54 ITEMS THAT EVOLVED ALL GROUPS OF PRACTICES.				
Domain	Type of Practice	Name of Practice	CVR	
Prananmayakosa	7:Breathing Exercises	Hands in and Out Breathing	0.375	
		( Antarbaahya HastachalanaShvasana )		
		Hands Stretch Breathing	0.625	
		(Hasta PrasaaranaShvasana )		
		Ankle Stretch Breathing	0.75	
		(Gulf PrasaaranaShvasana )		
		Alternate Leg Raise Breathing	0.625	
		( Vyatysapaadottanashvasana)		
		Both Leg Raise Breathing	0.625	
		( Dwayam Padottanasanashvasana)		
	8:Breathing kriya (rapid breathing practices)	Side Leg Raising Breathing	0.25	
		( Paarshvapadottanasanashvasana)		
		Dog Breathing	0.4	
		Rabbit breathing	0.75	
		9:Pranayama (Slow breathing practices)	Nadishuddhi	0.5
			Bhastrika	0.375
			Surya AV 27rounds 4 times a day	0.75
			Bhramari 9 round	0.375
			Seetali /Seetkari/Sadanta	-0.875
		TABLE-8: CONTD. SHOWS THE LIST OF 54 ITEMS THAT EVOLVED ALL GROUPS OF PRACTICES.		
Domain	Type of Practice	Name of Practice	CVR	
C. 1. Manomayakosa	10:Practices of Dharana followed by Dhyana	Nadanushandhan		
			Approved	
-Raja Yoga	Meditation	OM Meditation ( Omkar Dhyana )	in FGD	
C. 2 Manomayakosa	10: Yogic counseling using concepts of pure love to the divine.	Lecture on Bhakti Yoga		
- Bhakti Yoga	11: Singing devotional songs.	Bhajan session		
D. Vignanamayakosha	12:Yogic counseling and lectures	Lecture on Jnana Yoga-Counseling		
E. Anandamayakosha	13.Yogic counseling -interactive lectures	Yogic counseling		
	14. Work in blissful awareness of self-existence.	Karma Yoga activity		

**In second phase**, designed IAYT was validated by 16 subject matter (Yoga) experts. Validation of the 43 item module was carried out by arranging a focused group discussion (FGD) by inviting sixteen subject matter expert (SMEs), that included five Doctor of Medicine in Yoga,

eight Doctorates (PhD) in Yoga with minimum experience of 4 - 5 years in the field of Yoga, and three Yoga therapists (MSc in Yoga) involved continuously for 7 years in teaching the IAYT techniques to obese participants of all ages. The Sixteen SMEs marked the content validity on a three (0–2) point scale, viz. Not necessary - 0, Useful but not essential - 1, Essential - 2. After validation, data were analyzed using Lawshe's content validity ratio (CVR). Content validity ratio (CVR) was analyzed using Lawshe's formula using the formula  $CVR = (n_e - N/2) / (N/2)$ . Wherein  $n_e$  = number of SME panelists indicating “essential” and N =total number of SME panelists. As per Lawshe’s significance table the value of CVR for 16 SMEs = 0.5 which means all items with  $CVR > 0.5$  are valid and essential for the module.

CVR was calculated for physical and breathing practices only. Among them, 33 Yoga practices with  $CVR \geq 0.5$  were included in designed IAYT. Others practices like diet, meditation, counseling and lectures on Yoga were discussed in faculty group discussion (FGD) meeting and were approved by all participants. So those were also included in IAYT. Other Yoga practices with  $CVR \leq 0.5$  were excluded from designed IAYT.

**TABLE-9 SHOWS IAYT PRACTICES WITH CVZR  $\geq$  0.5 AND FGD APPROVED PRACTICES**

No.	Name of Practice	CVR
1	Yogic Diet	Approved in FGD
2	Fasting	
3	Vamandhouti	0.6
4	Laghushankhprakashalana	0.73
5	Kapalabhati	0.875
6	Jogging with jumping : backward, forward and side with Mukhadhouti	0.875
7	Backward and Forward Bending ( PashchaataPurstaatanamana )	0.625
8	Side Bending ( ParshvaNamana / ParshvaKarshana )	0.75
9	Back Swing ( PrushthaAndolana )	0.75
10	Hip Rotation ( Nitambachankramana )	0.5
11	Spinal Stretch with folded legs ( Baddhapaadamerudandaprasaarana )	0.875
12	Bhunaman	0.75
13	Chakkichalana Stretch	0.5
14	Butterfly	0.75
15	Tiger Stretch ( Vyaghraprasaarana )	0.625
16	Dhanurasana and Dhanurasana Swing	1
17	Surya Namaskara ( 5 dynamic and 1 slow )	0.875
18	Ardha Kati Chakrasana	0.625
19	Trikonasana	0.875
20	Parivrittatrikonasana	0.5
21	Vajarasana	0.75
22	Ushtrasana	1
23	Sasankasana	0.75
24	Vakrasana	0.5
25	Bhujangasana	1
26	Shalabhasana	0.875
27	Naukasanana	0.75
28	QRT ( Sheeghrashaithilyatantra )	0.75
29	Hands Stretch Breathing ( Hasta PrasaaranaShvasana )	0.625
30	Ankle Stretch Breathing ( Gulf PrasaaranaShvasana )	0.75
31	Alternate Leg Raise Breathing ( Vyatyasapaadottanashvasana)	0.625
32	Both Leg Raise Breathing ( DwayamPadottanasanashvasana)	0.625
33	Rabbit breathing	0.75
34	Nadishuddhi	0.5
35	Surya AV 27rounds 4 times a day	0.75
36	Nadanushandhan	
37	OM Meditation ( OmkarDhyana )	Approved in FGD
38	Lecture on BhaktiYoga	
39	Bhajan session	
40	Lecture on Jnana Yoga	
41	Counseling	
42	Yogic counseling	
43	Karma Yoga activity	

Thus we developed and validated IAYT for obese adolescents.



**In third phase**, pilot study with two armed perspective RCT (Randomized Controlled Trial) was conducted for one month on overweight & obese adolescent subjects of a residential school in Sangamner, Maharashtra, India who did not had any exposure to Yoga previously. (Figure 5-A)in method 23 overweight & obese adolescents (15 male and 8 female) between 11 & 17 years of age who consented to participate in the study were selected for the study. They were allocated into two groups (Yoga n=14 and control n=9). Signed informed consent was obtained from all participants and their parents or guardians/care taker in the prior stage of intervention.

The IAYT for obesity in adolescents consisting of Asana, Pranayama, Relaxation and Meditation techniques were introduced in a step by step manner. Each session of the intervention was for 60 minutes for five days in a week for 1 month. The control group continued regular physical activities and no specific physical activity was given. All the participants received same type of meal throughout the month. All the participants were assessed for weight, BMI, pulse, blood pressure, mid-arm circumference waist circumference, hip circumference , fasting blood sugar, serum total cholesterol, high-density lipoprotein , low-density lipoprotein , very low- density lipoprotein , serum triglycerides respectively at baseline and after 1-month of the intervention. All the 23 adolescents completed the intervention. There were no adverse effects observed during the study period.

**In fourth phase**, same study was conducted on larger sample size along with additional variables. (According to Figure 5-B in methods) 1400 students including both genders were screened from age of 11 year to 17 year (standard 5 to 9) in one of the reputed school in Pune city of Maharashtra state in India. Height, weight and BMI of all the students were recorded and obese participants (according to figure 1) having BMI > 95 th percentile were included who were ready to participate in the study with written consent. Participants having any physical disability, any psychosomatic disorder, consuming any medical drugs and exposed to Yoga within last 6 months were excluded from the study. All the participants are randomly divided in two groups. Yoga group (n = 25) and control group (n = 28). RCT (Randomized Controlled Trial) was conducted on 53 obese adolescents for 40 days. Special Yoga based training Program was conducted for Yoga group. Yoga intervention was consisting of specially designed and validated Yoga protocol of 60 minutes duration which included set of loosening exercises, *asana*, *pranayama*, *suryanamskara*, breathing practises and meditation

**TABLE 10 IAYT SHOWS SCIENTIFIC PROTOCOL OF INTERVENTION**

No	PRACTICES
1	Opening Prayer
	Yogena Chittasya Paden.....
2	Breathing Practices
2.1	Hands in & Out Breathing
2.2	Hands Stretch Breathing
2.3	Ankle Stretch Breathing
3	Loosening Exercise
3.1	Jogging : backward, forward & side
3.2	Jumping
3.3	Mukhadhauti
4	Standing Postures
4.1	Backward & Forward Bending
4.2	Side Bending
4.3	Spinal Twisting
4.4	Sit Ups from standing Position
4.5	Back Swing
4.6	Hip twist
4.7	Hip Rotation
4.8	Hip Stretch
5	Surya Namaskara
	Prayer – Hiranmayena patren----
	5-5 round Dynamic & 1 Slow
6	IRT
	Yogasanas
7	Standing Postures
7.1	Ardha Kati Chakrasana
7.2	ArdhaChakrasana
7.3	Padahastasana
7.4	Trikonasana
7.5	Parivrittatrikonasana
8	Sitting Postures
8.1	Vajarasana
8.2	Ushtrasana
8.3	Sasankasana
8.4	Vakrasana
8.5	Spinal Stretch with folded legs
8.6	Spinal Stretch with folded legs
8.7	Bhunaman
8.8	Chakkichalana Stretch
8.8	Butterfly
8.9	Tiger Stretch

<b>TABLE-10</b>	<b>CONTD. IAYT SHOWS SCIENTIFIC PROTOCOL OF INTERVENTION</b>
<b>9</b>	<b>Prone</b>
<b>9.1</b>	<b>Bhujangasana</b>
<b>9.2</b>	<b>Parvatasana</b>
<b>9.3</b>	<b>Dhanurasana &amp; Dhanurasana Swing</b>
<b>9.4</b>	<b>Shalabhasana Both legs</b>
<b>9.5</b>	<b>Naukasana</b>
<b>10</b>	<b>Supine</b>
<b>10.1</b>	<b>Alternate Leg Raise Breathing</b>
<b>10.2</b>	<b>Both Leg Raise</b>
<b>10.3</b>	<b>Side Leg Raising</b>
<b>10.4</b>	<b>Chakrapadasana (Leg Rotation)</b>
<b>10.5</b>	<b>Padasanchalana (Cycling)</b>
<b>10.6</b>	<b>Chakrasana</b>
<b>10.7</b>	<b>Setubandhasana</b>
<b>10.8</b>	<b>Bhujanmana Stretch</b>
<b>10.9</b>	<b>Padottanasana</b>
<b>10.1</b>	<b>Naukasana</b>
<b>11</b>	<b>Kriya</b>
	<b>Kapalabhati</b>
<b>12</b>	<b>Pranayama</b>
<b>12.1</b>	<b>Nadishuddhi</b>
<b>12.2</b>	<b>Bhastrika</b>
<b>12.3</b>	<b>Surya AV 27rounds 4 times a day</b>
<b>12.4</b>	<b>Seetali 9/Seetkari/Sadanta</b>
<b>12.5</b>	<b>Bhramari 9 round</b>
<b>13</b>	<b>Dhyana</b>
<b>13.1</b>	<b>Nadanushandhan</b>
<b>13.2</b>	<b>OM Meditation</b>
<b>14</b>	<b>QRT</b>
<b>15</b>	<b>Closing Prayer</b>
	<b>Sarve bhavantu Sukhina</b>

This intervention was conducted for 5 days a week for 40 days. 4 sessions of chanting, Karma Yoga, Yoga counselling were also provided. Participants of Yoga group were regular throughout the intervention and maintained 90 per cent of attendance. Control group was under observation with normal routine. Both the groups were provided same diet plan throughout the intervention. Parameters like weight, pulse rate, blood pressure, MAC ( Mid Upper Arm Circumferences), AC (Abdominal Circumference), WC(Waist Circumference), HC (Hip Circumference) along with physical tests like sit ups per minute and Flamingo balance test were assessed before and after intervention for both Yoga and control groups. Body Mass Index (BMI) parameters like total body fat percentage, resting metabolism, subcutaneous fat and muscle percentage of whole body, arms, trunk and legs region was also calculated before and after intervention for both Yoga and control groups.

60 minutes of Yoga practice 5 days a week.

- Monday, Tuesday, Wednesday, Thursday and Friday.
- 5 weeks (40 days).
- Four Yogic Counseling sessions & balanced diet sessions for Parents & Students including, happiness analysis, happy assembly, *KridaYoga*, *Bhajan*, *chantings* and *KarmaYoga* for 3 hour on every Saturday for 1 months.
- Trained Yoga instructors headed the practice sessions.
- The classes were held in the school campus.
- Variable assessment sessions were conducted in which variables were assessed by researcher with the help of Yoga instructors and school volunteers before and after the intervention period.
- The researcher recorded the data and monitored the Yoga sessions.  
Scientific protocol for intervention was followed as per table 10.

## 5.5 DATA EXTRACTION

- Trained research staff blinded to the intervention and both groups were responsible for data collection. Subjects filled out the forms without influence by the staff, and the staff was available to answer all questions and provide unbiased guidance.

### a. Demography

Information regarding age, gender, education and economic status was obtained through an interview.

### b. Anthropometric measurements

- BMI ( $\text{kg}/\text{m}^2$ ) -calculated using Metric BMI formula
- Mid arm circumference - using a simple centimeter measuring tape
- Abdominal circumference - using a simple centimeter measuring tape
- Waist circumference - using a simple centimeter measuring tape
- Hip circumference - using a simple centimeter scale
- Systolic pressure (mmHg) - using a sphygmomanometer

- Diastolic pressure (mmHg) - using a sphygmomanometer
  - Pulse rate
- c. **Chemical markers** - all blood tests done by same pathological laboratory for pilot project.
  - d. **BMI Parameter** - all BMI parameters were calculated using Body composition monitor Model HBF -701.for study 2
  - e. **Physical tests**
    - a. Sit ups -Number of rounds of sit ups in standing position within duration of one minute was calculated manually.
    - b. Flamingo Balance test - The duration of steady final posture was calculated manually on a wooden block of 60 cm length, 10cm width and 10 cm height.
  - f. **Psychological tests**
    - Body Awareness Questionnaire ( BAQ )
    - Child Eating Behavior Questionnaire (CEBQ)
    - Rosenberg self - esteem Scale ( RSES )
  - g. **Cognitive tests**
    - Digit Letter Substitution test
    - Six Letter Cancellation Test

## 5.6 ATA ANALYSIS

For computerized assessment and analysis of the data, all the data was entered in SPSS software version 20 and analyzed. The following statistical steps were followed for all types of variables.

### **Inferential statistics**

- Test of Normality.
- Within group analysis –

- ✓ Paired t test for parametric variables.
- ✓ Wilcoxon test for Non- Parametric variables.
  - In between group analysis
  - ✓ Independent Sample T Test
  - ✓ Mann –Whitney sample T test