

# CHAPTER III

## MATERIALS AND METHOD

The goal of this study was to investigate whether a brief yoga intervention minimized examination anxiety, stress and restoration of hormonal balance. If the results of this study indicate the brief yoga intervention lowers examination anxiety, teachers may utilize a yoga intervention with their students before examination, thereby potentially alleviating some of the symptoms of test anxiety and increasing academic performance. The methodology followed to conduct this scientific experiment has been presented in this chapter.

### 3.1 Selection of Subjects

The population of this study was 10<sup>th</sup> standard students of Uttarakhand. The sample of the study was restricted to the Secondary Schools of Naisela (Nainital). The examination anxiety inventory was administered on 640 students who are appearing in 10<sup>th</sup> standard final examination. It was observed that out of 640 students, 125 students, scattered in two different schools, had high level of examination anxiety. However, to have the feasibility, the experiment was conducted in one school i.e., Government High School, Naisela, P.O. Bel, Via. Patwadanger, Block Bheemtal, Dist. Nainital (Uttarakhand), where 78 students had high level of examination anxiety. Out of 78 students, who had high level of examination anxiety, the target sample for the experiment was sixty male students (n=60), age ranging from 16-17 years. The informed consent was obtained via the permission form. Biological data collected included gender and age. All data-sensitive materials (e.g. permission forms, and any data with the participant's name) collected during this study were secured and reporting of the results remained anonymous. A strict privacy was maintained towards preserving all sensitive forms.

### ***Inclusion and Exclusion Criteria***

The criteria for inclusion and exclusion of the subjects were as follows:

- The subjects, who are expected to remain present till the experimental trials are finished, were included in this study.
- The subjects suffering from known and serious health problem were excluded.

## **3.2 Design of Experiment**

A completely randomized group design (Rothstein, 1985) of two groups of equal numbers was adopted for this study.

Making the use of table random numbers all the 60 subjects were divided randomly into two groups viz; Group –A (Yoga) and Group – B (Control) with equal in numbers. The blue print of subjects' distribution has been presented in Table 3.1.

**Table 3.1**

### **Blue print of subjects' distribution**

<b>Group</b>	<b>No. of Subject</b>
Gr. A– Yoga Group	30
Gr. B – Control Group	30
<b>Total</b>	<b>60</b>

The design of the experiment has been planned in three phases as follows:

- Phase – I: Pretest
- Phase – II: Training or Treatment, and
- Phase – III: Post test

### **Pre – Test (phase – I)**

All the subject of the experimental and control groups were exposed to selected psychological and hormonal test to record the pre test data.

### **Treatment stimuli (phase – II)**

After the pre test was over, all the subjects of Group A were exposed to yoga training with their regular school schedule daily in the morning and evening for one hour except Sundays and holidays for a total period of six weeks. The subjects of control group, although did not receive the yoga training, however, they were kept busy with some recreational and physical activities daily 1 hour in the morning and one hour in the evening except Sunday and holidays during the total period of experiment. One yoga teacher was given responsibility to organize daily training programmes for a total period of six-weeks.

### **Post test (phase III)**

Finally, when the treatment or training period of six week was over, the posttest on psycho-physiological and hormonal variables was conducted for all the subjects of two groups.

The score in each criterion measure were taken before and after the experimental period of six weeks.

### **Potential Risks for the Research Population**

There were no risks associated with participation in the six week intervention, nor were there risks involved in completing dependent variable data. This was conveyed verbally to both the control and intervention groups during presentation to the participants in front of school authorities. It was also restated in consent forms.

### **Discontinuation Option for Research Participants**

Research participants were free to discontinue participation at any point in time without consequence. This was stated verbally to both the control and intervention groups during presentation to the participants in front of school authorities and parents of participants. It was also restated in consent forms.

### **Drop-outs**

Two students from the control group and one from the experimental group were irregular in attending the yoga intervention and therefore they were excluded from the study.

## **3.3 Selection of Variables**

The investigator reviewed various scientific literatures pertaining to the effect of yoga practices on selected psycho-physiological and hormonal variables from various resources (viz., books, journals, periodicals, magazines and research papers). The justification for selection of each variable is presented as follows:

## 1. Examination Anxiety:

**Justification:**The research evidence shows that test anxiety inhibits student performance (Wine, 1971)<sup>1</sup>.

## 2. Academic Stress:

**Justification:**Academic examinations are considered as one of the most acute stresses experienced by students (Deinzer *et al.*, 2000; Maes *et al.*, 1998)<sup>2,3</sup>.

## 3. Depression:

**Justification:**Evidence revealed that students feel worthlessness guilt, despair, depressive, delusional symptoms, inner restlessness, agitation, panic attacks, states of anxiety, sleep disorders and depression (Garlow *et al.*, 2008)<sup>4</sup>.

## 4. Mental Health:

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<sup>1</sup> J. Wine, "Test anxiety and direction of attention." *Psychological Bulletin*, 76, 1971, pp.92-104.

<sup>2</sup> R. Deinzer, C. Kleineidam, R. Stiller-Winkler, H. Idel, and D. Bachg, "Prolonged reduction of salivary immunoglobulin A (sIgA) after a major academic exam." *IntJ Psychophysiol*, 37, 2000, pp.219-232.

<sup>3</sup> M. Maes, *et al.*, "Influence of academic examination stress on hematological measurements in subjectively healthy volunteers." *Psychiatry Res*, 80, 1998, pp.201-212.

<sup>4</sup>S. J. Garlow, J. Rosenberg, J. D. Moore, A. P. Haas, B. Koestner, H. Hendin, and C. B. Nemeroff, "Depression, desperation, and suicidal ideation in college students: results from the American Foundation for Suicide Prevention College Screening Project at Emory University." *Depress Anxiety*, 25, 6, 2008, pp.482-488.

**Justification:**Previous research study suggests high prevalence of mental health problems among college students (Zivin, *et al.*,2009)<sup>5</sup>.

## 5. Concentration:

**Justification:**Evidence suggests that students concentration is limited and hard to maintain (Burke and Ray 2008)<sup>6</sup>.

## 6. Blood Pressure/Pulse Rate/Respiratory Rate/Electrodermal Activity:

**Justification:**Academic examination stress is reported to increase physiological and self-report measures of stress( Murphy *et al.*, 2010 Qureshi *et al.*, 2009)<sup>7,8</sup>.

## 7. Cortisol/DHEA:

**Justification:**Acute anxiety and stress has been reported to increase the activity of the hypothalamus-pituitary adrenal (HPA) axis with subsequent rise in cortisol level (Kirschbaum and Hellhammer, 1994)<sup>9</sup>.

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<sup>5</sup>K. Zivin, D. Eisenberg, S. E. Gollust, and E. Golberstein,“Persistence of mental health problems and needs in a college student population.”*J Affect Disord.*, 117, 3, 2009, pp.180-185.

<sup>6</sup> Lisa. A. Burke, and Ruth. Ray,“Re-setting the concentration levels of students in higher education: an exploratory study.”*Teaching in Higher Education*,13, 5, 2008, pp.571-582

<sup>7</sup> Lara. Murphy, Randy. Denis, Christopher. P. Ward, Jaime,and L. Tartar, “Academicstress differentially influences perceived stress, salivary cortisol, and immunoglobulin-A in undergraduate students.” *Stress*, 13, 4, 2010, pp.366-371.

<sup>8</sup> G. M. Qureshi, G. M. Seehar, M. K. Zardari, Z. A. Pirzado, and S. A. Abbasi,“Study of blood lipids, cortisol and haemodynamic variations under stress in male adults.” *Journal of Ayub Medical College Abbottabad*, 21, 1, 2009, pp.158-161.

<sup>9</sup>C. Kirschbaum, and D. H. Hellhammer, “Salivary cortisol in psychoneuroendocrine research: recent developments and applications.”*Psychoneuroendocrinology*, 194, 1994, pp.313-333.

Taking into consideration of feasibility criteria, availability of instruments and the relevance of the variables of the present study, the following variables were selected and appropriate tools were used:

### 3.3.1 Dependent Variables and Tools Used

At the baseline and after training intervention following dependent variables were assessed considering standard tests (Table 3.2).

**Table 3.2**

#### **Selected Variables and Tools used**

<b>Sr. No.</b>	<b>Test Name</b>	<b>Tools used</b>	<b>Measurement Units</b>
<b>PSYCHOLOGICAL VARIABLES</b>			
1.	Examination anxiety	Questionnaire(Agarwal and Kaushal, 2005)	Nearest to 1 point
2.	Academic stress	Questionnaire (Bhatnagar 2005)	Nearest to 1 point
3.	Depression	Questionnaire(Bhatnagar 2005)	Nearest to 1 point
4.	Mental health	Questionnaire (Jagdish & Srivastava 2005)	Nearest to 1 point
5.	Concentration	Questionnaire (Bera 200)	Nearest to 1 point
<b>PHYSIOLOGICAL VARIABLES</b>			
1.	Blood Pressure	Sphygmomanometer	Nearest to 1 mmHg
2.	Pulse Rate	Sphygmomanometer	Nearest to 1 beat/min
3.	Respiratory Rate	Biopac	Nearest to 1 Cycle/min.
4.	Electro-dermal Activity	Biopac	Nearest to 0.1
<b>BIOCHEMICAL VARIABLES</b>			
1.	Cortisol	Diagnostic Kit	Nearest to 0.1 ng/ml
2.	Dehydroepiandrosterone (DHEAs)	Diagnostic Kit	Nearest to 0.1 ng/ml

The participants were found really encouraged to exhibit their best effort in each of the above tests.

### **3.3.2 Independent Variables**

The independent variable or research intervention for this study consisted of yoga training sixty minutes daily for six weeks.

#### ***a) Designing Yoga Training Schedule***

Yoga training programme was designed on the basis of following principles:

- Yoga which is an ancient science, helpful not only for the cure of diseases but is also helpful in making and keeping already fit and healthy individuals more fit and healthy. And it has been observed that breathing exercise (pranayama) and meditation lead to better concentration and improved performance.
- Yoga training for thirty minutes improves fitness and skill execution. The training causes enhancement in the endorphin level of the brain, required for neurological functions, leading to an increase in endurance and general vigour of an individual, thereby causing improvement in skill execution. Practice of asanas improves physical and motor fitness. Asanas involve exercising of various muscle groups at different joints and numerous combinations and also provide massage to vital organs of the body, which effects their functioning in positive manner. The slow stretching and holding methods in yogic postures increase the flexibility, a necessary quality to maintain performance and avoid injuries.
- The very principles of yoga as described in Patanjala yoga sutra (Karambelkar, 1989) were followed strictly by yoga experts. Thus, the subject steadily with comfort performed the yoga practices.



- Yoga exercise were performed by restrict the repetition to once only because there is no indication in either patanjala yoga sutra or in Hath yoga to repeat the asana several times. Thus emphasizing the mastery over the practice of yoga exercise, the subjects were instructed to maintain them for quick a long times with steadiness and comfort.

### ***b) Training Method for Performing Yoga practices***

Yoga practices for the experimental Group A were constituted on the basis of the principles of classical yoga (Kavalayananda, 1933). Therefore, methods of performance were also taken care of on the basis of the followings:

- The researcher followed the principles of yogasana as described in Patanjala Yoga Sutra (Karambelkar, 1989). Thus, the subject performed the yoga practices steadily with comfort.
- Sessions were physically gentle and tailored to the needs and abilities of the participants. The students were encouraged to do only what felt appropriate for them, and to rest when necessary.
- Treatment or training period for the subject was six weeks duration daily in the morning for one hour.
- Asanas sessions were held in the school hall provided by school. Lighting in the room was dimmed and soft ambient music was played to create an atmosphere of respectful, soothing quiet. Yoga mats were provided by the school for the students. The students were instructed to bring clothing appropriate for comfort, warmth and freedom of movement for the sessions. The asana session was between 7.15 to 8.15 am under the guidance of expert yoga teacher.

- The control group was also engaged in some light jobs of no physical adaptation, while experimental group was practicing scheduled yoga practices as treatment stimulus. All other conditions were alike in terms of daily school routine.
- Subject, in general, were interested and adoptive to the programme. None of the subjects came to the notice of investigator having a long history of practicing the selected yoga practices. Regularity in attendances was about more than 90% which is satisfactory.

### **3.4 Collection of Data**

The data were collected two times i.e., during pre-test and post-test for each variable by administering their respective tests. The pre test data was collected between 17<sup>th</sup> January to 19<sup>th</sup> January 2012 while the post test data was collected during 2<sup>nd</sup> March to 4<sup>th</sup> March 2012. The tests were administered at a spacious hall provided by participant school. The tests used were explained to the subjects prior to their administration.

The population for the intervention group consisted of students appearing for S.S.C. board examination from Government High School Naisela, P.O. Bel, Via. Patwadanger, Block Bheemtal, Dist. Nainital (Uttarakhand) . The school's enrollment for board examination was seventy male students. Although, there are approximately sixty schools in Nainital district but the selected school was easily approachable and the authorities permitted to conduct the experiment. Further, the students as well as parents were convinced about the importance of the experiment. Nevertheless, permission letter from the principal as well as informed consent from the students was obtained from the students prior to the experimental intervention.

### **3.5 Reliability of Data**

The reliability of data ensured in establishing the instrument reliability, testers' reliability, and reliability of tests.

#### ***Instrument Reliability***

The instruments used in this study were obtained from the standard firms which cater to the needs of various research laboratories and accepted as accurate enough for the purpose of the study.

#### ***Testers' Competency***

To enhance the investigator's competency in the techniques of conducting the tests, the investigator had a number of practice sessions in the testing procedure under the guidance of the experts.

#### ***Quality Assurance and Quality Control***

All the biochemical tests were conducted at Raghav Path Lab, Haldwani, Uttarakhand. One Lab technician was given responsibility for collection of saliva sample and processing of the sample during pre and post testing. Further, the diagnostic kits from the same batch was used for pre and post test. Necessary standards and controls were processed along with sample to ensure reproducibility of the results.

Further, for assessment of physiological variables such as EDA and Respiratory rate, researcher of this study, approached Gentech India Pvt Ltd., Delhi. The Gentech India Pvt Ltd. is a company which deals with Biopac instrument. As the researcher of this study was well known to the service

engineer of Biopac he approached him and requested to conduct the pre and post test with the stand by instrument available with company.

### **3.6 Description of Tests Measuring Dependent Variables**

Detailed description of the following variables has been presented here-

#### **3.6.1 Psychological Variables**

##### **A) Examination Anxiety**

###### ***Instrument:***

*Students Examination Anxiety Questionnaire*(Agarwal and Kaushal, 2005)<sup>10</sup>

###### ***Background of test:***

Mandler and sarason (1952)<sup>11</sup> pioneered in the development of an anxiety scale designed especially Dependent variable was taken as examination anxiety which was measured by Students Examination Anxiety Test (SEAT). The research of Sarason (1962)<sup>12</sup> on test anxiety opened way for educational researchers to examine the effects of evaluation anxiety on learning and performance.

Most of the test of examination anxiety (TAQ,AAT etc) could not be used in original form in Indian conditions. The other tests developed in India such as KEAS (Kerala Examination Anxiety Scale) by Nair cannot be applied

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<sup>10</sup> Madu Agarwal and Varsha Kaushal, “*Students Examination Anxiety Questionnaire*”. (Agra: National Psychological Corporation, 2005).

<sup>11</sup>G. Mandler, and S. B. Sarason, “A study of anxiety and learning.”Journal of Abnormal and Social Psychology, 47, 1952, pp.166-173.

<sup>12</sup>I. G. Sarason, and V. J. Ganzor, “Anxiety, reinforcement, and experimental instruction in a free verbal situation.”Journal of Abnormal and Social Psychology, 65, 1962, pp.300-307.

due to unavailability of norms and limited usage. The present test is designed to assess the level of examination anxiety among secondary school children.

### ***Development of SEAT:***

The test has been constructed on the basis of Kerala Examination Anxiety Scale (KEAS) developed and standardized by Nair . The present test has 38 items, which describe the experience of anxiety. Twenty one items have been taken from KEAS modified from and 17 new items were incorporated. Initially 50 items were prepared in Hindi. The draft was given to three psychologists to evaluate for clarity, relevance and content of the items. The test was then constructed incorporating this feed back.

### ***Items Analysis:***

In order to select suitable items to be retained, pretest was administered to a sample of 100 pupils of IX to X classes and necessary modifications were made. Finally the test was administered to 200 male/female students. No limit was imposed. Students took an average of 15 minutes to complete the test. The subjects were required to respond to each item in terms of "Yes" or "No". The "Yes response to any item was indicative of anxiety and was given a score of one. A score of zero was given to a "No" response. For items analysis the point biserial correlation were computed. The items having coefficient of correlation significant beyond .001 levels were retained in the final form.

### ***Sample:***

The test was then administered to a sample of 700 students of both sexes from randomly selected schools of Meerut.

### ***Reliability:***

The reliability of the test was determined by two methods –

- The reliability by the test method after an interval of 15 days to one month was found to be 0.92.
- The internal consistency reliability was ascertained by adopting Split-Half procedure (n= 555) using Spearman Brown formula. The reliability coefficient of the test was found to be 0.87.

**Validity:**

Two external criteria were employed to find validity of the test. These were –

- Sinha's Comprehensive Anxiety Test (SCAT)
- Ratings by friends.

The correlation between the scores of SEAT scores and SCAT WAS Found 0.57 (n=115) the correlation between SEAT scores and ratings by friends on a five point scale was found to be 0.89.

**Instruction for Administration:**

- The instruction printed on the test form may be read aloud by the examiner to the testee.
- There is no fixed time limit. Usually an individual takes 1 to 15 minutes to complete the testee.

**Scoring:**

The test can be scored by hand. Each "Yes" responses is indicative of anxiety, hence one mark is awarded for each "Yes" responses. The sum total of "Yes" responses would be the total anxiety score of the individual.

**Norms and Interpretation:**

Percentile norms were computed for both boys and girls separately. Table 1 present the percentiles for boys.

**TABLE 1**  
Showing Percentile norms for Boys

Percentiles	Scores			Interpretation
	Class IX & X	Class XI	Class XII	
99	30	36	35	Extremely high anxiety
95	27	31	29	
90	24	27	24	
80	21	23	22	
75 (Q <sub>3</sub> )	20	22	20	High Anxiety
73	18	20	19	
60	17	18	17	Normal Anxiety
50 (Md)	15	16	15	
40	13	14	13	
30	10	11	11	Low anxiety
25 (Q <sub>1</sub> )	9	10	10	
20	8	9	9	Extremely low anxiety
10	6	6	6	
5	5	5	5	
<b>M</b>	19.7	16.18	15.27	
$\sigma$	6.6	7.9	7.3	
<b>N</b>	89	110	159	

The individual may be classified into one of the five categories on the basis of scores obtained on the test. An individual above 75<sup>th</sup> percentile may be regarded as hyper anxious students. He may be in need of counseling and psychological help. The extremely low scores, below 25<sup>th</sup> percentile indicate the person as under motivated. The middle group of scores would represent essentially normal individuals.

**Procedure:**

The instructions printed in the test form were read aloud by the researcher to the subjects. There was no fixed time limit. Usually an individual took 12-15 minutes to complete the test.

## **B) Academic Stress and Depression**

### ***Objective:***

To measure the level of Anxiety, Depression and Stress.

### ***Equipment:***

Anxiety, Depression and Stress Scale (Bhatnagar *et al.*, 2005)<sup>13</sup>.

### ***Procedure:***

This scale was developed by Pallavi Bhatnagar. This scale was considered as an appropriate questionnaire for the assessment of the Anxiety, Depression and Stress of an individual. The total numbers of items in this scale were 48 which are divided into three categories. i.e. Anxiety, Depression and Stress.

### ***Development of the Scale:***

An exhaustive review of literature was done viz.- Mental Health Inventory by Augustine(1988)<sup>14</sup>, PGI Health Questionnaire N-2 by Wig and Verma(1978)<sup>15</sup>, Anxiety scale by Shrivastava and Tiwari (1988)<sup>16</sup>, CMI Health Questionnaire (Hindi) by Wig, Pershad and Verma (1983)<sup>17</sup> and PGI General

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<sup>13</sup> Pallavi. Bhatnagar, Megha. Singh, Manoj. Pandey, Sandhya, and Amitabh, “*Anxiety, Depression and Stress scale*”. (Agra: National Psychological Corporation, 2005).

<sup>14</sup> Augustine, Mental health inventory in second handbook of psychological and social instruments by Pestonjee, D. M. (1988) (Ed.), (Concept Publishing Company, New Delhi, 1988).

<sup>15</sup> N. N. Wig, and S. K. Verma, PGI health questionnaire N-2, in second handbook of psychological and social instruments edited and compiled by Pestonjee, D.M. (1988). (Concept Publishing Company, New Delhi, 1978).

<sup>16</sup> D. N. Srivastava and G. Tiwari, Anxiety scale in second handbook of psychological and social instruments by Pestonjee, D. M. (1988) (Ed.), (Concept Publishing Company, New Delhi, 1988).

<sup>17</sup> N. N. Wig, D. Pershad, and S. K. Verma, CMI health questionnaire (Hindi), (Agra: National Psychological Corporation, 1983).



well being by Verma and Verma (1989)<sup>18</sup>, Anxiety control Questionnaire by Rapee *et al.*, (1996)<sup>19</sup>, Health Anxiety Questionnaire by Lucock and Morely (1996)<sup>20</sup>, Taylor Acute Stress disorder interview by Bryant *et al.*, (1988)<sup>21</sup>, Minnesota Multiphasic personality inventory PTSD scale (MMPI-PTSD) by Keane, Malley and Fairbank (1984)<sup>22</sup> PTSD checklist by Weathers (1993)<sup>23</sup>, DSM-IV and ICD-X for development of this questionnaire.

A scale of 63 items was developed (25 items for anxiety, 19 items for depression and 14 items for stress each) in English. After that back translation method was used to translate the items in Hindi with the help of four professionals (2 psychologists, one linguist and one social worker) and they were requested to again translate it in into English. Those items which maintained the same meaning after the back translation were retained. Thus of the 63 items, 48 items (19 for anxiety, 15 for depression and 14 for stress).

A pretry out of 48 items was undertaken on a sample of 20 people (10 males and 10 females) to explore the comprehensibility and endorsement of items and all the 48 items were retained.

### **Reliability:**

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<sup>18</sup> S. K. Verma and A. Verma, PGI general well-being measure. (Lucknow: Ankur Psychological Agency, 1989).

<sup>19</sup> R. M. Rapee, M. G. Craske, T. A. Brown, and D. H. Barlow, "Measurement of perceived control over anxiety related events." *Behaviour Therapy*, 27, 1996, pp.279-293.

<sup>20</sup> M. P. Lucock and S. Morley, "The health anxiety questionnaire." *British Journal of Health Psychology*, 1, 1996, pp.137-150.

<sup>21</sup> R. A. Bryant, A. G. Havey, S. T. Dang, and T. Sackville, "Assessing acute stress disorder: Psychometric properties of a structured clinical interview." *Psychological Assessment*, 10, 1998, pp.215-220.

<sup>22</sup> T. M. Keane, P. F. Malloy, and J. A. Fairbank, "Empirical development of an MMPI subscale for the assessment of combat-related post traumatic stress disorder." *Journal of Consulting and Clinical Psychology*, 52, 1984, pp.888-891.

<sup>23</sup> F. W. Weathers, B. T. Litz, D. S. Herman, J. A. Huska, and T. M. Keane, "The PTSD checklist: Reliability, validity and diagnostic utility." Paper presented at the annual meeting of the International society for traumatic stress studies, San Antonio, TX, 1993.

Reliability of the total scale in terms of internal consistency as measured by Cronbach's Alpha and Spearman-Brown coefficient is 0.81 and 0.89. The obtained reliability for anxiety, depression and stress subscales as measured by Cronbach's alpha is 0.76, 0.75 and 0.61 and when measured by Spearman-Brown coefficient is 0.86, 0.86 and 0.76 respectively.

**Scoring:**

Each item is scored 1 if endorsed "YES" and 0 if endorsed "NO". The range of the score is 0-19 for anxiety subscale, 0-15 for depression subscale and 0-14 for stress subscale. Higher score indicates experiencing greater anxiety, depression and stress and vice-versa.

**Norms of the Scale:**

**Table – 2**

S.no	SUB-SCALES			INTERPRETATION
	ANXIETY	DEPRESSION	STRESS	
1	0-3	0-2	0-4	NORMAL
2	3-5	2-4	4-6	MILD
3	5-9	4-9	6-9	MODERATE
4	Above 9	Above 9	Above 9	SEVERE

**C) Mental Health**

**Instrument:**

Mental health inventory (Jagdish & Srivastava 2005)<sup>24</sup>

The mental health is defined as person's ability to make positive self-evaluation, to perceive the reality, to integrate the personality, autonomy group

<sup>24</sup> Jagdish and Srivastava, "Mental health inventory". (Agra: National Psychological Corporation, 2005).

oriented attitudes and environmental mastery. This questionnaire has 72 items which are distributed in six dimensions which are as follows:

1. Positive Self-Evaluation (PSE): It includes self-confidence, self-acceptance, self identity, feeling of worth-whileness, realization of one's potentialities, etc.
2. Perception of Reality (PR): It is related to perception free from need distortion, absence of excessive fantasy and broad out look on the world.
3. Integration of Personality (IP): It indicates balance of psychic forces in the individual and includes the ability to understand and to share other people's emotions, the ability to concentrate at work and interest in several activities.
4. Autonomy (AUTNY): It includes stable set of internal standards for one's action, dependence for own development upon own potentialities rather than dependence on other people.
5. Group Oriented Attitudes (GOA): It is associated with the ability to get along with others, work with others and ability to find recreation.
6. Environmental Mastery (EM): It includes efficiency in meeting situational requirements, the ability to work and play, the ability to take responsibilities and capacity for adjustment.

***Reliability of the Inventory:***

The reliability of the inventory was determined by split half method using odd-even procedure. The reliability coefficients of different dimensions of mental health and over all are presented below:

	<b>Dimensions</b>	<b>Reliability Index</b>
1.	Positive self evaluation	0.75
2.	Perception of reality	0.71
3.	Integration of personality	0.72
4.	Autonomy	0.72

5.	Group oriented attitudes	0.74
6.	Environmental competence	0.71
	Overall	0.73

**Norms:**

The norms for mental health are presented in following table:

Dimension of M.H.	Very Good	Good	Average	Poor	Very Poor
PSE	38.32 & Above	33.70 to below 38.31	29.10 to below 33.70	24.49 to below 29.10	Below 24.49
PR	29.82 & Above	25.95 to below 29.82	22.07 to below 25.95	18.20 to below 22.07	Below 18.20
IP	44.82 & Above	38.66 to below 44.87	32.44 to below 38.66	26.23 to below 32.44	Below 26.33
AUTNY	22.35 & Above	19.04 to below 22.34	15.74 to below 19.04	12.44 to below 15.74	Below 12.44
GOA	37.51 & Above	33.37 to below 37.50	28.23 to below 33.37	23.10 to below 28.23	Below 23.10
EM	36.24 & Above	31.36 to below 36.26	26.43 to below 31.35	21.52 to below 26.43	Below 21.52
Overall	195.20 & Above	176.45 to below 195.89	157.01 to below 176.45	137.57 to below 157.01	Below 135.57

**Scoring:**

In this scale 4 alternative responses have been given to each statement i.e. Always, often 4 scores to 'Always', 3, scores to 'Often', 2 scores to 'Rarely', and 1 score to 'Never' marked responses as to be assigned for true keyed (positive) statements where as 1, 2, 3 and 4 scores for 'Always', 'Often', 'Rarely', and 'Never' respectively in case of false keyed (negative) statements.

**E) Concentration****Instrument:**

## General Concentration Inventory (Bera 2005)

### ***Introduction:***

Attention is the ability to concentrate mentally and observe carefully. Listening refers to applying oneself to hearing something. One must pay attention in order to listen effectively, but attending is also important when doing other tasks like reading, writing, taking tests, and reviewing information. The quality and quantity of attention is vital to the learning process. The process of attending influences the ability of the student to move new information from sensory memory to short-term memory. One must maintain attention through rehearsal in order for information to be moved into short-term memory. Attention and listening are intricately linked to Encoding and Retrieval and Memory. Attention or concentration, and memory are two mental skills directly related. *In fact, many memory complaints have nothing to do with the actual ability to remember things.* They come from a failure to focus properly on the task at hand. Take the example of not remembering where you parked your car after shopping at the mall... It is likely that you did not pay much attention to where you parked the car in the first place, thus leaving your brain with few opportunities to register any information that could be recalled later to help you find your car. The same reasoning goes for not remembering where we put our glasses! Many of our actions are performed automatically. By opposition, focusing attention is effortful. As you know, with age the brain needs more time to process information. Along with speed of processing, other brain functions decline. A crucial one is the ability to focus and ignore distraction. As we age it thus get harder and harder to pay attention. But focusing our attention on the task at hand is key for better memory performance.

Nevertheless, attention is a multifaceted neural process that allows for differential central nervous system processing of information arising from the external or internal environment. Attention is important for the brain to use its

limited resources for higher order processing of only certain salient stimuli and not of stimuli or information that may not be relevant. What attention actually consists of continues to be debated since the psychologist William James wrote more than 100 years ago, “Everyone knows what attention is. It is the taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought”(James 1890)<sup>25</sup>. There are many aspects of and theories about attention (Posner and Dehaene 1994)<sup>26</sup>. The attentional and alertness systems are critical components necessary for all aspects of cognition, including memory and language.

Further, the primary purpose of attention strategies is to provide a non-medication alternative to improving concentration and attending. The strategies for improving attending and listening may be applied in a number of academic situations, such as: during lectures, while doing assigned readings, during individual study sessions, when completing homework assignments, during group study sessions, while taking tests.

However, there was no simple and easily available technique to assess the concentration level. Therefore, the author has developed this tool to assess the concentration level.

### ***Development of the Scale:***

The development was initiated by an exhaustive review of literature and by the formation of potential attention and concentration related items. The items were selected on the basis of difficulties or intricacies involved in the process of attention. Additionally, telephone calls and personal meetings were held with professionals working in the area of memory and concentration to get in-depth information of the different aspects the questionnaire should

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<sup>25</sup> W. James, “*The Principles of Psychology*”. 1, New York: Henry Holt; 1890.

<sup>26</sup> M. I. Posner, and S. Dehaene, “Attentional networks”. *Trends Neurosci.* 17, 1994, pp.75–79.

cover. Based on this information and available literature it was decided to divide the questionnaire into nine major sections assessing 1) Emotional intelligence, 2) Perseverance, 3) Ability for a consistent attention, 4) Reaction time, and presence of mind, 5) Achievement motivation, 6) Ego strength, 7) Basic personal values, 8) Creativity and intelligence, and 9) Adjustment with aggravated situations (anxiety, stress, tension).

***Constituents of the questionnaire:***

- The questionnaire for evaluation of general concentration was standardized by Dr. T. K. Bera, Former, Assistant Director of Research, Kaivalyadhama, Lonavla (India).
- There are 9 major dimensions and each dimension has 5 questions. Thus, there are total 45 questions.
- The dimensions are- 1) Emotional intelligence, 2) Perseverance, 3) Ability for a consistent attention, 4) Reaction time, and presence of mind, 5) Achievement motivation, 6) Ego strength, 7) Basic personal values, 8) Creativity and intelligence, and 9) Adjustment with aggravated situations (anxiety, stress, tension).
- Scoring is done on three points i.e., each question has 3 alternative answers. The highest to lowest scores are 3-point, 2-point and 1-point respectively.
- Norms are graded on the basis of Likert's 5-point scale i.e., Excellent (126-135 points), Good (110-125 points), Average (71-109 points), Fair (56-70 points) and Poor (55 points and below).

- Reliability (test-retest) reliability is 0.71 and construct validity is 0.74.

### 3.6.2 Physiological Variables

#### A) Blood Pressure

**Description / procedure:**

The Digital blood pressure instrument was positioned in such a manner that the subject would not be able to see the display. Blood pressure was recorded after the subject has rested quietly for 5 minutes. The subject was asked to sit with the arm resting on the bench, the elbow approximately at the level of the heart. The cuff was attached, the pressure then increased to approximately 180 mm Hg.

**Scoring:**

Blood pressure was recorded in the units of millimeters of mercury (mm Hg). Normal blood pressure is approximately 120 systolic and 80 diastolic, for both men and women.

	acceptable	borderline	high
Systolic	< 140	140 - 160	> 160
Diastolic	< 85	85 - 95	> 95

Proper care was taken before blood pressure measurement as physical exertion and anxiety can cause rise in blood pressure substantially.

The digital blood pressure monitor of Omron Company was used to record systolic and diastolic blood pressure.

#### B) Pulse Rate

**Objective:**

To measure the Pulse rate of subject.

**Equipment:**



Stop watch (Digital B.P. Apparatus).

***Procedure:***

The subjects were instructed to take supine position sphygmomanometer was attached to arm pulse rate was counted.

***Recording:***

The number displayed digitally on the display board was recorded as heart rate per minute.

***Instruction:***

Before taking the heart rate the subjects were asked to relax for five minutes in the supine position.

## **C) Respiratory Rate**

***Purpose:***

The purpose is to measure rate of respiration. We are not aware that when we breathe whether our chest moves up and down or our abdomen. While breathing if our chest moves we call it chest breathing and if abdomen moves it is known as abdominal breathing.

***Method:***

The subjects were directed to lie down at supine condition. The researcher asked the subjects about those to whom he likes very much. This was done to divert the subject's attention because they should never know that the researcher is measuring respiratory rate. Here the researcher observed indirectly the movement of chest.

***Scoring:***

The movement of chest as noted was recorded along with respiratory rate (RR) per minute in the score sheet.

## **D) Electrodermal Activity**

### ***Instrument:***

Biopac instrument was used for the assessment of electrodermal activity. EDA is manifested by sweating reactions of the autonomic nervous system, measures skin conductance levels (SCL) and skin conductance responses(SCR)<sup>27</sup>. A certain measurement of the reactions (over 0.1uS) for five minutes was used for the analysis.

### ***Introduction:***

Electrodermal Activity is a term used to describe changes in the skin's ability to conduct electricity. It is a useful, fast, cheap, well established (since 1880's), low-tech and relatively non-invasive psychophysiological measure, which can be used to study many issues including: cognition, affect and individual differences. EDA is a measurement taken of the function of the eccrine sweat glands. The function of these glands can be influenced by two things: "*sympathetic innervation via acetylcholine and activity of myoepithelial cells which are controlled by the endocrine system via epinephrine levels in the blood stream.*" The preferred way of reporting EDA tends to be as a measure of conductance rather than resistance. This is because of the true nature of the skin (it is not a single resistor, but instead a series of resistors that act in parallel). Therefore, the most common unit of measurement in EDA is the microsiemen. EDA is linked to changes in hydration in the sweat glands. For example when the sweat glands fill with salt-water the skin then shows less resistance to electricity or conversely greater conductance. "*Following sympathetic excitation of the eccrine gland sweat is forced into the sweat channel. Once enough sweat has passed into the*

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<sup>27</sup> Park, Sungwon, "Electro-dermal activity, heart rate, respiration under emotional stimuli in schizophrenia." *International Journal of Advanced Science and Technology*, 9, 2009, pp.1-8.

*channel, a valve at the top of this channel opens and sweat is released onto the skin surface. Both an increase in the amount of sweat in the channel and an increase in the amount of sweat on the skin surface probably affect skin conductance.*" There are various causes to account for fluctuations in skin hydration including: emotional sweating and thermoregulation.

Ways in which EDA can be measured include: endosomatic measurement and exosomatic measurement. Endosomatic measurement is the more invasive of the two techniques and involves microneurography, i.e., the application of tiny electrodes directly onto the 'sympathetic' skin neurons. This yields a direct measurement of the electrical activity of the skin's neurons. This technique records both uniphasic and biphasic responses, making the data collected similar in type to that produced by an EEG. The exosomatic measurement involves two electrodes that are placed on the skin's surface and an electrical signal of tiny magnitude is passed over this surface between the two electrodes. Although both AC and DC signals can be used DC is the most common. It does not matter which type of current is used because the data is uniphastic (the current measured at the receptor is either increased or decreased as compared to the baseline). Exosomatic measures are possibly just as good as endosomatic measures in that there is such a strong correlation between skin neuron firing rates and skin conductance. The data that is used comprises the amount and pattern of electricity recorded at the receptor electrode.

The size of the EDA response varies depending upon whether or not you are looking at tonic or phasic changes. In this experiment exosomatic measure was used.

### **3.6.3 Biochemical Variables**

#### **A) Cortisol**

***Instrument:***

(Diagnostic kit used: DRG International, Inc., USA. Instrument Used: Bio-Rad 680 Elisa Plate Reader/Bio-Rad Elisa PW40 Fully Automated Washer).

***Principle of the Test:***

The estimation of Salivary Cortisol by ELISA method is based on the competition principle and the microplate separation. An unknown amount of Cortisol present in the sample and a fixed amount of Cortisol conjugated with horse-radish peroxidase compete for the binding sites of mouse monoclonal Cortisol -antiserum coated onto the wells. After one hour incubation the microplate is washed to stop the competition reaction. After addition of the substrate solution the concentration of Cortisol is inversely proportional to the optical density measured.

***Specimen Collection and Preparation:***

Eating, drinking, chewing gums or brushing teeth should be avoided for 30 minutes before sampling. Otherwise, it is recommended to rinse mouth thoroughly with cold water 5 minutes prior to sampling. Do not collect samples when oral diseases, inflammation or lesions exist (blood contamination). If there is visible blood contamination in the specimen, it should be discarded, rinse the sampling device with water, wait for 10 minutes and take a new sample. Saliva samples were collected using special saliva sampling devices (vial and straw), i.e. Sali-Tubes 100 (SLV-4158).

***Assay Procedure:***

All the necessary precautions and procedures as presented in diagnostic kit literature were strictly followed to assess the samples that are presented below:

- All reagents and specimens were allowed to come to room temperature before use. All reagents were mixed without foaming.
- Once the test has been started, all steps were completed without interruption.

- New disposal plastic pipette tips for each standard, control or sample were used to avoid cross contamination.
- Absorbance is a function of the incubation time and temperature. Before starting the assay, it is recommended that all reagents are ready, caps removed, all needed wells secured in holder, etc. This will ensure equal elapsed time for each pipetting step without interruption.
- As a general rule the enzymatic reaction is linearly proportional to time and temperature.

***Test Procedure:***

- Each run must include a standard curve.
- Secure the desired number of coated strips in the frame holder.
- Dispense 100  $\mu$ L of each Cortisol *Standard* and *Control* into appropriate wells.
- Dispense 100  $\mu$ L of each sample into selected wells.
- Dispense 200  $\mu$ L of *Enzyme Conjugate* into each sample and standard well and mix the plate thoroughly for 10 seconds.
- Incubate for 60 minutes at room temperature.
- Briskly shake out the contents of the wells and rinse the wells 3 times with diluted Wash Solution (400  $\mu$ L per well).
- Strike the inverted wells sharply on absorbent paper towel to remove residual droplets.
- Add 200  $\mu$ L of *Substrate Solution* to each well.
- Incubate for 30 minutes at room temperature.

- Stop the reaction by adding 100 µL of *Stop Solution* to each well.
- Determine the absorbance of each well at 450 nm.
- It is recommended that the wells be read within 10 minutes.

***Calculation of Results:***

- Automated method: The results in the Bio-Rad ELISA reader have been calculated automatically using a microplate analyst software

***Expected Normal Values:***

1.2 – 14.7 ng/mL

## **B) Dehydroepiandrosterone (DHEAs)**

***Instrument:***

(Diagnostic kit used: Dia Metra, USA. Instrument Used: Bio-Rad 680 Elisa Plate Reader/Bio-Rad Elisa PW40 Fully Automated Washer).

***Principle of the Test:***

Dhea-s (antigen) in the sample competes with horseradish peroxidase dhea-s(enzyme-labelled antigen) for binding onto the limited number of antidhea-s (antibody) sites on the microplates (solid phase). After incubation, the bound/free separation is performed by a simple solid-phase washing. The enzyme substrate (H<sub>2</sub>O<sub>2</sub>) and the TMB-Substrate (TMB) are added. After an appropriate time has elapsed for maximum colour development, the enzyme reaction is stopped and the absorbances are determined. Dhea-s concentration in the sample is calculated based on a series of standard. The colour intensity is inversely proportional to the Dhea-s concentration of in the sample.

***Specimen Collection and Preparation:***

Eating, drinking, chewing gums or brushing teeth should be avoided for 30 minutes before sampling. Otherwise, it is recommended to rinse mouth thoroughly with cold water 5 minutes prior to sampling. Do not collect samples when oral diseases, inflammation or lesions exist (blood contamination). If there is visible blood contamination in the specimen, it should be discarded, rinse the sampling device with water, wait for 10 minutes and take a new sample. Saliva samples were collected using special saliva sampling devices (vial and straw), i.e. Sali-Tubes 100 (SLV-4158).

***Procedure:***

***Preparation of the Standard:***

**(S0,S1,S2,S3,S4)** Before use, mix for 5 min with rotating mixer. The standard has the following concentration of DHEAS:

	S0	S1	S2	S2	S4
ng/mL	0	0.2	1.0	3.0	12.0

***Preparation of Diluted Conjugate:***

Prepare immediately before use. Add 10  $\mu$ L of Conjugate (reagent 3) to 1.0 mL of Incubation Buffer (reagent 2). Mix gently. Stable 3 hours at room temperature (22-28°C).

***Preparation of Wash Solution:***

Dilute the content of each vial of the buffered wash solution concentrate (50x) with distilled water to a final volume of 1000 mL prior to use. For smaller volumes respect the 1:50 dilution ratio. The diluted wash solution is stable for 30 days at 2 – 8°C.

***Procedure:***

As it is necessary to perform the determination in duplicate, prepare two wells for each of the five points of the standard curve (S0-S4), two for each sample, one for Blank.

**Pipette:**

Reagent	Standard	Sample	Blank
Sample		50 $\mu$ L	
Standards S0-S4	50 $\mu$ L		
Dilute Conjugate	150 $\mu$ L	150 $\mu$ L	
Incubate at 37°C for 15 minutes. Remove the contents from each well; wash the wells 3 times with 0.3 mL of diluted wash solution.			
TMB Substrate	100 $\mu$ L	100 $\mu$ L	100 $\mu$ L
Incubate at room temperature (22-28°C) for 15 minutes in the dark.			
Stop Solution	100 $\mu$ L	100 $\mu$ L	100 $\mu$ L
Shake the microplate gently. Read the absorbance (E) at 450 nm against Blank.			

**Calculation of Results:**

- Automated method: The results in the Bio-Rad ELISA reader have been calculated automatically using a microplate analyst software

**Expected Normal Values:**

0.2 – 2.7 ng/mL

### 3.7 Description of Training Intervention

The yoga intervention was imparted to the experimental group for 2 hours daily (morning: 1 hr. & evening: 1 hr.), every day in a week except Sundays. For 1<sup>st</sup> 15 days, they were given **Easy-Course of Yoga** and during



next 30 days they were trained in **Full Course of Yoga** programmes (along with **OM recitations** as per Kaivalyadhama Tradition and Dhyana) as follows:

Easy Course of Yoga	Full Course of Yoga
Bhujangasana, Ardha-Shalabhasana, Ardha-Halasanana, Vakrasana, Chakrasana, Paschimatanasana, Yoga-Mudra omkar Ujjayi Pranayama (with possible alterations keeping in view of "Yoga module")	Sarvangasana,, Halasana, Bhujangasana, Shalabhasana, Dhanurasana, Ardha-Matsyendrasana, Paschimatanasana, Mayurasana, Shavasana, Yoga Mudra, Ujjayi, Bhastrika. (with possible alterations keeping in view of "Yoga module") Kapalbhati

### ***Justification for Yoga Practices***

- For most children, it all starts with a feeling of anxiety, nervousness, or worry before and during exams. This leads to fear and tension. If not attended to, these emotions could transform into depression or dejection, particularly for children in higher classes. When this goes out of hand, some children start contemplating suicide. Most children are not taught how to handle anxiety and eliminate stress, which can be done effectively through simple yoga techniques.
- Daily yoga practice makes studying easy as efficiency increases and the memory becomes sharper. Yoga has always proven to be an aid in relaxing the mind and body, for children and adults. It has been observed that children perform their best when they are cool and relaxed. We can not only prevent children from going into depression, but also boost their confidence and ability to perform. All this can be achieved just by teaching them some easy, yet powerful, yoga and breathing techniques.
- Yoga practices begins by working with the body on a structural level, helping to align the vertebrae, increasing flexibility, and strengthening

muscles and tendons (Khalsa, 2001)<sup>28</sup>. At the same time, internal organs are toned and rejuvenated, the epidermal, digestive and cardiovascular systems are purified of toxins and waste matter; the nervous system and endocrine systems are balanced and toned; and brain cells are nourished (Khalsa, 2001). The end result is increased mental clarity, emotional stability, and a greater sense of self.

- A prospective study on undergraduates with mild to moderate depression, anxiety, or stress reported improvements in a number of mood and stress measures after a 7-week yoga intervention (Smith and Pukall, 2009)<sup>29</sup>

### ***Principles adopted while teaching yogic practices:***

Group of authentic yoga practices was identified on the basis of consensus and are competent enough to remove anxiety of an individual. Standard Techniques are adopted with reference to the Tradition and Research findings (if any). Nomenclature is approved unanimously. The recommended duration of one yoga class was one hour. Total duration of the course was 45 days. Following procedure was followed during training yoga practices:

### ***Elapse of time between food and yogic exercises:***

- Heavy Meal - Practice after 4 Hours.
- Moderate food (Solid/Liquid) - Practice after 1 hours
- A cup of tea - Practice after ½ hour
- Food can be taken after 30 minutes of yogic practices.

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<sup>28</sup>S. K. Khalsa, *I.S.S. Keep it simple: A guide to yoga*. DK Publishing, NY: New York. 2001.

<sup>29</sup> K. B. Smith and C. F. Pukall, "An evidence-based review of yoga as a complementary intervention for patients with cancer," *Psycho-Oncology*, 18, 5, 2009, pp.465–475.

**Place:**

- Any well ventilated place should be used.
- Do not allow your body to be exposed to a strong drought.

**Seat:**

- A carpet moderately soft and large enough to accommodate the length and breadth of an individual.

**Instructions for the Practice of Asanas:**

- Asanas work with the deeper muscles of the body and therefore utmost care was taken while practicing it.
- Practice was given according to student's body limitations. They were advised not to compete with fellow practitioner or Attempt to attain final position right in the beginning, especially when their body is not ready for the same.
- Maintenance of the final posture in asana according to one's own limitations and in a relaxed way was emphasized.
- During maintenance of Asana there was no tremor or any type of discomfort.
- They were instructed not to alter the breathing voluntarily during asana. As body would adjust the breathing as per the posture.
- The practitioners had followed each instruction sincerely and practice them with optimum attention.

**Instructions for the Practice of Pranayama:**

- Pranayama is special Hathayogic practice in which we are working with our respiration and in which we try to manipulate, control and prolong the respiration.

- This is related with the most important and delicate system of the body i.e. Respiratory system and Cardiovascular system. Therefore we should never experiment with Pranayama.
- Hathapradipika declares that Control over respiration results into control over mind.
- Hatha Texts caution “Just as a wild animal like tiger, lion or an elephant is tamed gradually, similarly the respiration should be controlled gradually”.
- According to Hathapradipika (Lesson II, Verse No.23 ), traditionally pranayama has three phases. They are known as **Puraka (P)** - Controlled Inhalation **Kumbhaka(K)**– Controlled Retention **Rechaka (R)** – Controlled Exhalation. The ideal ratio according to tradition is 1 (P) : 4 (K) : 2 (R) The ideal Matra for **P : K : R** is 20 : 80 : 40 (for highest / best type ) 16 : 64 : 32 (for mediocre type) 12 : 48 : 24 ( for lowest type).

However, while practicing Pranayama, students were never told to resort to any of the above mentioned ideal ratio.

## **DESCRIPTION OF YOGA PRACTICES**

### **1) Bhujangasana**

***Source:***

Gheranda Samhita II:42

***Technique in brief:***

- Take prone lying position.

- Fold hands at elbows, place palms by the side of chest, fingers not crossing the shoulder line.
- Raise the head, chest and abdomen up to navel, look upward.
- Maintain the posture comfortably for some time (approximately 15 to 20 seconds according to ones capacity). Put the attention on the back muscles.
- Come back to the initial position slowly by reversing the steps.

***Do's and Don'ts:***

- Put minimum weight on hands. Divide your weight on chest and arms. However, in the beginning weight be put on hands.

***Benefits:***

- This effects the spine deeply and makes it flexible. Effective against asthma and dyspepsia.

## **2) Ardha-Shalabhasana**

This is a modified simple form of Shalabhasana. Swami Kunalayanandaji has formulated this Asana for beginners and those who are unable to perform shalabhasana.

***Technique :***

- Take prone lying position, legs together, fingers of the legs pointing outward, soles upward, hands by the side of the body, fists closed, forehead on the ground.
- Bring chin forward and place it in the ground.
- Raise right leg slowly without bending at the knee. Do not tilt the pelvic. Maintain it for a while.

- Slowly return to the original position.
- Do the same by the other leg. This is one round of Ardha-Shalabhasana.

***Remember :***

- Do not tilt your pelvic while raising your legs.
- Do not bend the leg at the knee while raising.

***Benefit and Limitations:***

- This strengthens the muscles of the lower abdomen.
- It removes visceroptosis and helps in coordination of lower extremity.
- Those suffering from lumbar spondilites should not practice it.
- Those suffering from muscle cramps should practice it cautiously.

### **3) Ardha-Halasanana**

***Introduction:***

It is a preparation for the complete plough posture (Halasana). In Sanskrit “ardha” means “half”.

***Stages:***

Preparation – The starting position is resting on the back (supine dicubitus) with the legs together. The arms remain by the side of the body with the hands on the floor.

- Raise the right leg without bending the knee up to 30 degree, 60 degree and 90 degree and stop there for a few seconds.
- Remain at 90 degree and wait for some time.

- Come back slowly and rest for a while.
- Start with the other leg.
- Do the exercise with both legs together.
- Maintain the posture according to ones capacity.
- Relax in Shavasana.

***Salient points to remember:***

***Do's:***

- Try to do all the movements very slowly and smoothly.
- Stop at 30 degree, 60 degree and 90 degree while raising the legs and while bringing them down.
- Maintain a normal breath throughout the practice.
- Raise the legs without bending the knees.
- In the beginning one may raise alternate legs only and some time one may raise both legs together.

***Don'ts:***

- Do not bend the knees.
- Do not jerk the body while lifting the legs up or by bringing them down.
- Do not exert beyond your capacity to reach the final position.
- Do not tense face or neck muscles.

#### **4) Vakrasana**

This Asana is designed to twist the spine to the right and left side in from its erect position. The spine is made up of highly elastic joints and can be moved to any direction.

***Procedure:***

- Bend the left leg in the knee and place its heel near the thigh. Keep the sole of the left foot flat on the floor and the thigh and knee touching to the chest.
- Place the left hand in front of the right hand in such a way that the fingers of both the palms face each other and the palms remain flat on the floor.
- Now turn the neck and the trunk to the right, twisting the spine and look back above the shoulder. Continue smooth breathing.

***Position:***

- In this Asana the spine is to be kept straight.
- The lower end of the spine and both the hips be placed well on the floor and stabilize them.
- Then with the support of the neck and shoulders twist the upper vertebrae to the right. At the same time, the standing knee be kept close to the chest.
- Along with the neck, the sight should also be turned to the right side and stabilize it in that direction.

***Releasing:***



- Turn the neck to the front.
- Restore the hand to its place.
- Straighten the left leg and take the sitting position.

***Duration:***

- This Asana should be retained for minimum two minutes on each side. With more practice this duration can be increased to six minutes.

***Internal Effects:***

The elasticity of the spine increases as it gets twisted in its erect position. Along with the spine the belly and other internal organs also get twisted and receive the desired strain. It also has very good effect on the spinal cord and its functioning is improved.

***Precaution:***

One should avoid the temptation of attaining the ideal position if strain is unbearable.

## **5) Chakrasana**

In order to provide lateral bending to the spine, Swami Kuvalayanandaji has invented it. Chakra means 'wheel'. In this asana the whole body is given the shape of a wheel or half a wheel, hence it is called Chakrasana.

***Technique:***

- Stand erect with legs together, toes together, hands by the side of the thighs, gaze in front.

- Slowly raise your one hand (right) from the side and bring it parallel to your shoulder, hands straight. Palms facing downwards.
- In the same position turn the palm towards the sky.
- Start raising your hands upward and let the arms touch the ear. Fingers will Point towards sky.
- Now start bending laterally towards left side. Loosen the left part of your body. The left hand will go slope down from the thigh together with the body.
- After maintaining for some time, slowly return your hands and stand erect.
- Similarly practice it from other side. This forms one complete round of Chakrasana.

***Remember:***

- While bending do not bend forward or backward. Only the upper part of the waist will bend laterally either towards left or right.
- Do not start bending before hand is completely straight upward.
- While practicing asana gaze in front.

## **6) Paschimatanasana**

***Source:***

It is a traditional asana mentioned in the Hathapradipika as “Paschimatan” (I 28-29) and in the Gheranda Samhita as “Paschimottana” (II 26). The Siva Samhita describes a difficult variation of it as “Ugrasana” in (III 111-112). In Sanskrit “Paschima” indicates “back”, the root “tan” means, “to stretch” and “asana” indicates “a stable and comfortable posture”. Swami Kuvalayananda included it under the “Yogic physical culture positions”.

**Stages:**

Preparation - This practice is done by sitting down on the floor with a straight back and the legs extended together. The arms remain relaxed by the sides of the body with the hands on the floor.

- Slowly lift the arms and bend forward to clasp the toes or ankles.
- Try to bend further with a gentle stretch to place the head near to the knees and elbows on the floor if possible. Bend forward from the pelvic area. Do not force the spine at the thoracic vertebra.
- Maintain the posture for some time while breathing, relaxed.
- Come back slowly to the initial position by reversing the steps.
- Relax.

***The salient points to remember:*****Do's :**

- Bend forward and relax while exhaling.
- Try to keep the spinal column in line. Bend forward from the pelvic area.
- Concentrate on the back muscles.
- Maintain a normal breath throughout the practice.
- Try to do all the movements very smoothly and slowly.
- If it is too difficult to clasp the toes, place the hands on the calf or thigh.
- Increase the asanas maintenance time slowly by regular practice.

**Don'ts:**

- Do not over do it.
- Do not jerk the body while bending.
- Do not hold the breath.
- Do not bend the knees.
- Do not bend forward from the thoracic vertebra, do it from the pelvic area. Avoid pulling down from the back muscles.
- Do not contact the abdominal muscles.

**7) Yoga-Mudra*****Introduction:***

In Sanskrit “Yoga” indicates “union” and here “Mudra” may mean “symbol” or “attitude”. Swami Kuvalayanandaji indicated it under the “four additional exercises.” The exercise is named Yoga Mudra as it is traditionally believed to be of help in the attempt for the awakening of intelligence and consciousness in man. This type of “nervous system training” was named “nerve culture” by Swami Kuvalayanandaji.

***Technique:***

- To remain in a sitting position with the legs folded by putting the right foot on the left thigh and the left foot on the right thigh as in Padmasana.
- Fold the hands on the back. Bend forward slowly and try to repose flat upon the heels touching the floor with the forehead if possible.
- Maintain the posture for some time, come back slowly to the initial position and relax. You may repeat this position conveniently, by changing the foot locks and hands grip.

**Stages:**

Preparation – This practice thus thought sitting down with the legs folded by putting the right foot on the left thigh and the left foot on the right thigh as in Padmasana.

- Clasp both hands on the lumbar area.
- Bend forward slowly and try to repose flat upon heels touching the floor with the forehead. Feel that heels give a mild pressure to the abdomen.
- Keep a normal breath during the practice and do not over do it.
- Maintain the posture for some time and come back slowly to the initial position by reversing the steps.
- Concentrate on the inner sensation and relax for a while.
- Repeat this position conveniently; you may alternate the position of the feet in the foot lock.

***Salient points to remember:******Do's :***

- Try to bend forward smoothly, comfortably and relaxing while exhaling.
- Keep the spinal column in line while bending forward from the pelvic area.
- Concentrate on the back muscles.
- Maintain a normal breath throughout the practice.
- Try to do all the movements very slowly.
- The exercise should last for some seconds and be repeated one time more.

- Increase the maintenance slowly by regular practice.

***Don'ts:***

- Do not force to reach the final position.
- Do not jerk the body while bending.
- Do not hold the breath.
- Do not lift the buttocks while bending.

## **FULL COURSE OF YOGA**

### **1) Sarvangasana**

***Source:***

May be considered an advanced variety of Viparita Karani. Very old tradition.

- Lie supine on the ground over the blanket, keeping the arms stretched above the head.
- Raise the legs together very slowly and gracefully (without bending at the knees) till it forms about 45 degree to the ground.
- Raise the legs further to 90degree position.
- Now raise the buttocks and the trunk also, taking support of the arms and the elbows, without lifting the head. Rest the elbows on the ground firmly and support the back with both the palms. Straighten the trunk with the hands till the chine is well set in the suprasternal hollow. Bring the legs parallel to ground.
- Keep the body; erect stretching it up vertically supporting on the shoulder but relaxingly. Maintain for about 2 minutes. Carefully avoid

all jerks and keep the head on the ground.

- Slowly come back to Sthiti.

***Benefits:***

Maintains the thyroid healthy, which in turn keeps the body active and healthy. Beneficially influences the Pelvic organs, both in males and females. Also useful in curing varicose veins, piles, hernia and menstrual disorders. Persons with cervical spondylosis should not do this asana.

## **2) Halasana**

***Introduction:***

It is a traditional posture in which the body imitates the shape of a plough. In Sanskrit “Hala” means “plough” and “asana” indicates “a stable and comfortable posture”. This asana benefits all the body by increasing the spine flexibility. While practicing one should not force to reach the final position but maintain the comfortable point. Flexibility will increase day by day naturally.

***Stages:***

Preparation – The starting position is resting on the back (supine dicubitus) with the legs together. The arms remain by the side of the body with the hands on the floor.

- Raise both legs without bending the knees up to 30 degrees and stop there for a few seconds.
- Raise the legs slowly up to 60 degrees and stop again for a few seconds.
- Then raise the legs up to 90 degrees and stop for a few seconds, once more.

- Go further bringing the legs towards the head by lifting the buttocks from the floor till the feet touch the floor over the head. Feel the stretching at the lumbo sacral region. Put the toes further if possible till the stretching is felt at thoracic and cervical region.
- Place the hands over the head.
- Place the chin in the glottis as in the chin lock (Jalandhara Bandha).
- Maintain the posture according to ones capacity and come back to the initial position slowly by reversing the steps.
- Relax in Shavasana.

***Salient points to remember:***

***Do's:***

- Try to do all the movements very slowly and smoothly. It is sometimes advised to practice Ardha (half) Halasana or Vipritkarni before starting this practice.
- Stop at 30 degree, 60 degree and 90 degree while raising the legs up and while bringing them down.
- Maintain a normal breath throughout the practice.
- Give support to the back with the hands if the legs do not reach the floor in the beginning.

***Don'ts:***

- Do not bend the knees unless the legs get too much tension.
- Do not jerk the body.
- Do not practice beyond the capacity.
- Do not withdraw the hands from the back until the feet reach the floor.



### 3) Shalabhasana

**Source:**

Gheranda Samhita – II /39. Shalabh means 'locust' as the position of the body in the asana appears to be like that of a locust. To facilitate easy learning first learn Ardha Shalabhasana.

**Procedure:**

- Exhale and inhaling, raise both the legs from the waist keeping them straight in the knees. Keep the toes stretched to the backside and continue normal breathing.
- Take the precaution that the legs are straight in knees as otherwise the strain on desired organs is reduced and desired results are missed. During the practice chin should rest on ground.

**Position:**

Keeping the raised legs straight in the knees, stretch the toes towards the backside. At this point the legs may tremble, but this trembling can be stopped if the raised legs are slightly lowered. Attempt should be made to raise the legs as much as possible without having any tremble and then stabilize them at that point and keep the breathing normal.

**Releasing:**

Inhale and exhaling bring both the legs down on the ground and then back to the prone position.

**Duration:**

Only difference between Ardha Shalabhasana and this asana is that both the legs are raised simultaneously instead of one in this asana. As the strain is more, the duration be reduced.

***Internal Effects:***

This asana mainly centers the lower vertebra of the spinal cord and the muscles of the abdomen and thighs. The strain activates their blood circulation. As a result of this the concerned organs become more active and efficient. This strain is effective on small and big intestine and certain enzyme producing glands.

***Precaution:***

People suffering from Back problems, TB in intestine, Ulcer in stomach, hernia should consult Yoga expert before practicing this asana. Jerks and unbearable strains should be avoided.

**4) Dhanurasana*****Introduction:***

It is a posture in which the body is supposed to imitate the shape and stand of a bow. This traditional asana is mentioned in the Gheranda Samhita (II 18) and Hathapradipika (I 25) in Sanskrit “Dhanus” means “bow” and “asana” indicates “a stable and comfortable posture”. Dhanurasana can be considered as a combination of Bhujangasana and Shalabhasana.

***Stages:***

Preparation – The starting position is resting on the chest (prone) with the chin on the floor. Maintain the legs together and arms by the side of the body.

- Slowly bend the knees, bring the heels near to the back and hold both ankles with the hands.
- While pulling the ankles from the back raise the chest and legs till the body remain on the abdomen and the spine gets stretched backward.

- Try to maintain a normal breath during the practice. After some time you may try to relax in the posture.
- Remain in the posture for a while and come back to the initial position by reversing the steps. Relax.

***Salient points to remember:***

***Do's:***

- Try to keep the knees together.
- Concentrate on the back muscles.
- Maintain a normal breath throughout the practice.
- Try to do all the movements very smoothly and slowly.

***Don'ts:***

- Do not force to reach the final position pulling the ankles too much.
- Do not jerk the body while moving it to avoid lesions and sprains.

## **5) Ardha-Matsyendrasana**

***Source:***

Simplified form of Matsyendrasana, tradition is old. This is named after a great Yogi, Matsyendra

***Technique in Brief:***

- Take long sitting position, fold right leg at knee and place the heel near the left hip.
- Fold the left leg and place the sole by the right side of the right knee.
- Now, turning the body towards left side, cross the right hand against left knee and catch hold of the ankle.

- Now take the left hand towards back and place it on the ground or wrap it on the waist while twisting the body towards left as much as possible.
- Come back in the reverse sequence.
- Repeat with the other leg.

***Do's and Don'ts:***

- Practice 'Vakrasana' regularly before resorting to this practice. Do not lean forward while twisting. Catch the toe if possible.

***Benefits:***

- Makes the spine flexible. It is useful in relieving constipation and dyspepsia

## **6) Mayurasana**

***Technique:***

- Kneel with the knees about 12 inches apart.
- Place the hands, palms down on the floor between the knees with the wrists to the front.
- Bend forward until the abdomen is resting on the elbows.
- Then raise the body and legs to a horizontal position with the legs outstretched as a letter V. The horizontal body is now resting on the hands with the forearms vertical. Hold the position for a few seconds only.

***Benefits:***

- This posture is very good for the digestive organs. The blood is concentrated and sent to the digestive organs, which also get toned up by the intra-abdominal pressure.
- This exercise has a good effect on the expelling action of the colon. It is very beneficial for obesity, piles, and constipation.
- It develops the chest.
- The exercise is very regenerative and quite stimulating.

## **7) Shavasana**

### **Source:**

Hathapradipika I/32

### **Brief Technique:**

### **Technique:**

- Lie on your back and let your body relax completely.
- Your feet 30 to 40 cms apart.
- Arms on your sides away from your body, palms facing upwards.
- Eyes closed.
- Concentrate on your breathing.
- Toes falling outward.
- Head according to your convenience.

### **Important guidelines:**

- No tension in any part of the body.
- Loosen your legs, calf muscles. Hamstring, hip, concentrate on your stomach concentrate on your breathing, and all the parts of your body.

- Feel the cool air while inhaling and warm air while exhaling.

## 8) Ujjayi

It makes the respiratory system stronger. It activates thyroid region by increased awareness.

### **Note:**

The above verse referring 'Ujjayi Pranayama' is from old Hatha Yoga text, wherein the technique of Pranayama with Kumbhaka has been described. For the convenience of the beginner the technique of easy Ujjayi Pranayama without Kumbhaka is being described.

### **Technique:**

- Sit erect in any comfortable posture. Keep spine erect.
- Inhale, slowly drawing air by both the nostrils in such a way that while inhaling the touch of air is experienced in the throat and some sound is produced.
- During inhalation do not allow abdomen to bulge out, let the chest expand.
- After completing inhalation slowly exhale. During exhalation chest should go inside and abdomen should remain steady.

### **Remember:**

- While doing Ujjayi air should touch the throat.
- Do not let abdomen to bulge out.
- After practicing it for few days, knowing your limitations, keep the ratio between inhalation and exhalation 1 : 2.

- In easy Ujjayi Pranayama, inhalation and exhalation can be practiced by both the nostrils.

## 9) Bhastrika

Bhastrika (Bellows) is the most powerful of all Breathing Exercises. Bhastrika or Bellows consists a series of pumping followed by the retention of breath like Kapalabhati.

Bhastrika is primarily consists of forced rapid deep breathing which serves as a basis for many varieties of exercises, all of which may be described by the same name. Although air is forced both in and out, the emphasis is placed upon the expulsion or explosion of air. A series of such expulsions, each following the other in quick succession without either Full or Empty Pause, is called "A Round". Beginners should limit a round to about five explosions, though the number may be increased to ten, or even more if needed to obtain the desired effect. The desired effects range from increased ventilation, increased Blood Circulation, clearing of the Nasal Passages and increased thinking capacity to eliminating of all Mental Disturbances.

Although you can breathe through your mouth or both mouth and nose, regular breathing is limited to either both or one nostril. The breath-stroke in the rapid succession of breaths may or may not be very deep, but it is customary to finish or follow a round by the deepest possible inhalation and exhalation. A series of normal breaths should occur before undertaking a second round. A deepest possible inhalation and exhalation may, and perhaps should, introduce each round. Some nasal hissing can be expected but avoid unpleasant sound and fluttering of the nasal skin surfaces. You may perform the Bhastrika exercise while standing but it is advisable to do it in a Seated Position in order to allow maximum Relaxation of the abdominal muscles and easy diaphragmatic breathing. Variations include using a full pause after each round, partial glottis closures and Alternation of Nostrils.

## 10) Kapalabhati

It is classified as one of the six processes in Yoga. “Kapala” in Sanskrit means forehead and “bhati” means to shine hence the name. It removes impurities from the passages of the nostrils and the sinuses by the forceful current of the air. This is done in sitting position by a foot lock, placing of the right foot on the left thigh and left foot on the right thigh. Place the hands on the knees. Sit erect. Exhale suddenly and forcibly giving an inward stroke at the naval region. Let the abdomen relax and simultaneously inhale. In the beginning practice 10 – 20 rounds of Kapalabhati. The number of strokes and the speed may be increased as one gets used to the practice.

### **Stages:**

#### **Starting position:**

Sitting with the legs extended together. Place the right foot on the left thigh. Similarly place the left foot on the right thigh. Place the hands on the respective knees.

- Raise the chest a little and sit erect.
- Exhale suddenly giving an inward stroke at the naval region.
- Relax the abdomen completely and inhale.
- Repeat the forceful exhalation and inhalation a number of times comfortably.
- Lower the chest and release the hands from the knees.
- Remove the left foot from the right thigh and extend it.
- Remove the right foot from the left thigh and come back to starting position.

#### **Salient points to remember:**



***Do's:***

- Practice this after a firm practice of Padmasana.
- Keep the spinal column vertical.
- Concentrate on the rhythm of the inhalation and exhalation.
- Try to do all the movements very smoothly and firmly.
- Maintain a normal breath if required after the practice.

***Don'ts:***

- Do not sit loosely.
- Do not jerk the shoulder.
- Do not hold the breath.
- Do not distort the nose and face during practice.
- Do not lean forward or backward.

**11) Omkar**

Omkaara dhyana involves meditation on Om, the shabda-bramhan (Bramhan in the form of a word or sound). The technique to perform this dhyana is as follows:

- Sit in any meditative posture with spine and head erect.
- Close your eyes and relax the whole body.
- Spend a minute or two in breath awareness.
- Now visualize a bright orange or blue colored Om at the eye brow center.

- Simultaneously start chant Om mentally.
- Let the visualization and chanting be uninterrupted.
- Be in this position as much as you can.

This dhyana gives a feeling of divine bliss if done correctly. You may find that Om is changing its color and size on its own. Sometimes Om may get substituted by bright light on its own. This is perfectly normal. After some practice you will find that your practice becomes steady and yields bliss and joy that cannot be explained in words.

## **3.8 Procedure of the Study**

### **3.8.1 Preliminary phase**

Pre test was conducted with consent in writing from all the subjects and the Principal of the school, prior to this programme.

Each subject was given individual code number i.e. Case number and record card prepared by the investigator so that they can be identified easily.

Demonstration of the test and question asked by the students were given and explained. They were also motivated properly. Uniform for the testing of the subject was tracksuit.

Standard procedures were followed for testing all the selected variables.

### **3.8.2 Daily Administration in Training Phase**

During the experiment, attendance of the subjects was taken regularly and the percentage of attendance after completion of training was found satisfactory. Any question asked by the students has been clarified and they

were found contented with the teacher / trainer. They were also motivated in such a way so that Hawthorne effect is avoided.

Treatment or training period for the subjects was for six weeks. The duration of training / day was 60 minutes in the morning and evening session, 6 days a week (except Sundays and holidays) for a total period of 6 weeks.

Yoga practices were taught and practiced in a yoga hall inside the campus, whereas during the same period control group was engaged in recreational activities. The instructional part for experimental group was looked after and tackled by qualified teacher.

### **Adaptation of the Training Schedule**

As the subjects were between age group 16 to 17 years, a seven-day practice period for adaptation of most of the scheduled practices for the selected group was good enough. However, some of the selected exercises required more gradual and longer duration (7 – 10 days) for adaptation. Regularity in attendance was satisfactory.

### **Administration of Tests**

The subjects were assembled on the ground and they were oriented the objectives and requirements of this project. The schedule of testing programs was notified to the subjects and testing stations were established to gather the data related to the project.

## **3.9 Statistical Analysis**

Descriptive Statistics have been applied to process the data prior to employing inferential statistics. Since there were three types of major dependent variables (psychological, physiological and biochemical) of varied nature along with two testing programmes (i.e. Pre-test and Post-test)

conducted for two different groups, following inferential statistics have been applied:

- For psychological variables 2 x 2 x 11 Factorial ANOVA followed by Scheffe's post hoc test.
- For physiological variables 2 x 2 x 5 Factorial ANOVA followed by Scheffe's post hoc test.
- For hormonal variables 2 x 2 x 2 Factorial ANOVA followed by Scheffe's post hoc test.