CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

In track and field athletics, there are many events. The Discus throw is a field event, which is popular and many athletes are participating in this event. In fact, to achieve success in discus throw athletes need to improve psychophysiological and morphological status along with various components of physical fitness, skills and technique.

Discus throws game, now a day, becoming popular and many sports person are participating in this track and field event. This game demands high power and energy to achieve success. In fact, athletes need to develop psycho-physiological as well as physical fitness components. The player has to maintain coordination between lower and upper body. Balance, coordination, power are the key factors for discus throwers. Further, as this is fast game wherein thrower has to control his breath to throw the discus at farthest distance. It is evident that a discus thrower needs control over breathing along with particular level of leg strength, speed, and loosens up most of the joints, bones, muscles etc to exhibit top performance.

Muscular strength is most important parameter that predicts the power production of particular muscle group. Therefore, speed, balance and explosive power are supposed to be key factors for discus throw performance.

In traditional Indian system sport is a play (Lila), is an activity (Karma, Karya) or a function which has an aim and object (Prayojana). It requires strength (Bala). Before the action takes place, it is called potential energy. It is static (Gatirahita). When force is applied it becomes released and acquires motion (Vega, Gati) i.e. dynamic energy. It starts moving and expanding following Newton's laws and the laws of conservation of
energy in Thermodynamics. This released energy has some orientation and direction. It acquires some field or zone (Kshetra) called space (Dik, Des'a). It has some speed and acceleration and momentum (Vega, Satatya). All this process follows some order and sequence (Krama) and has some regulated (Niyantrita) rhyme, rhythm, concordance and harmony (Laya, Tala, susangati), homogenity and balance (Ekata, Samatva). This is an ideal situation.

All this requires psychosomatic health and well being s'arira, Manasa, Svasthya); and efficiency (Kshamata). This in turn is governed by higher non-material (Adravya), or higher factors i.e. fatuities called mind, intellect, ego, consciousness and self soul (Mana, Buddhi, Aharrkar, Citta, Atma) These faculties also require harmony, coordination, co-operation and acuity (Samgati, Samanvaya, Sahakarya, Kshamatva) They are not visible, gross; but invisible, abstract, subtle. On them depend the physical movements i.e. behaviour. The body on the other hand is gross, visible. Between these two opposite aspects of living beings, there is a link, a thread. And that is in the form of senses, sense faculties which also are invisible, subtle. This is the field of Neurology. Through these, the mental faculties release their orders to the organs. This function is of five kinds: word (hearing, audition), touch (knowledge of hot and cold etc), form, figure (seen by eyes i.e. vision) taste, (sweet, bitter etc.), smell (good, bad).

Given the importance of breathing exercise for performance in discus throw event the researcher of this study thought of introducing pranayama techniques and breathing exercises for discus throwers. As it has been found that pranayama improves respiratory function as well as it improves concentration. Numerous studies have shown that yoga practices and pranayama are effective in improving psycho-physiological and physical fitness in varied population. However, very few studies have been carried out in sports person.

Further, a Discus thrower needs to have proper training to mastery over scientific technique to exhibit top performance. In fact, coaches impart many scientific training schedules to Discus throwers for improving performance. Nowadays, many yoga practices are incorporated in the training schedules of Discus throwers. It is known that
'breathing' plays a significant role for improving power performance. Moreover, controlled breathing may be of immense importance for discus throwers. The present investigation was conducted if pranayama practices (known as controlled breathing) can help for the Discus throwers. Thus, the objectives of this investigation were—

1. To assess status of morphological variables of discus throwers.
   a) To assess height
   b) To measure weight
   c) To assess body mass index
   d) To measure arm girth
   e) To measure chest girth
   f) To measure thigh girth
   g) To measure calf girth

2. To assess baseline status of physical fitness variables
   a) To see the shoulder strength of discus throwers
   b) To measure explosive power of leg muscles
   c) To measure strength of abdominal muscles
   d) To assess flexibility
   e) To assess breath holding time
   f) To measure balance

3. To see the psychological status of discus throwers
   a) To assess sports anxiety of participants
   b) To assess mental health of discus throwers

4. To assess status of physiological variables of discus throwers
   a) To record the status of pulse rate
b) To measure systolic blood pressure

c) To measure diastolic blood pressure

d) To measure respiration rate

5. To prepare training schedule of pranayama and breathing exercises in view of enhancing performance of discus throw in elite athletes.

6. To impart training of pranayama and breathing exercise in elite athletes for a total period of eight weeks.

7. To see the effect of pranayama and exercise training on morphological, physiological, psychological and physical fitness variables in elite athletes.

A controlled experiment was conducted and tested the following hypotheses:

H₁: The training of ‘breathing exercises’ may be effective in improving morphological, psycho-physiological and physical fitness attributes needed for improving discus throwing performance among the athletes.

H₂: The training of ‘pranayama practices’ may be effective in improving morphological, psycho-physiological and physical fitness attributes needed for improving discus throwing performance among the athletes.

H₃: The combined stimulus i.e., ‘breathing exercise plus pranayama practices’ may be effective in improving the morphological, psycho-physiological and physical fitness attributes needed for improving discus throwing performance among the athletes.

H₄: The combined stimulus ‘breathing exercises plus pranayama practices’ may be more effective than other ‘two stimuli’ (i.e., ‘pranayama’ as well as ‘breathing exercises’ separately) in improving the morphological, psycho-physiological and physical fitness variables needed for improving discus throwing performance among the athletes.
This research study was carried out to find out the efficacy of breathing exercises and pranayama practices on morphological, psycho-physiological and physical fitness variables in elite discus throwers. The methodology followed to carry out this study is explained in brief as follows:

To achieve the purpose of present experiment four parallel groups were formed consisting of equal number of elite male athletes. Three different training interventions were scheduled for three experimental groups while one group was wait list control. The duration of training intervention was twelve weeks.

The Experiment

a) Sampling

For this experiment (n=80) male elite athletes aged 18-20 years were selected from Maharashtra state. Purposive sampling technique was used to conduct this experiment. All the subjects were selected from one college to achieve the purpose of this study. The selected subjects were divided randomly into four groups with equal number. Three experimental groups (Group I: n₁ = 20; Group II: n₂ = 20; Group III: n₃ = 20) and one wait list control group (Group IV: n₄ = 20). The investigator communicated with all the subjects regarding experimental intervention and made sure that they are willing to undergo testing program as well as training schedule. Before finalizing the participation of all subjects investigator followed some inclusion and exclusion criteria as follows:

- The participants who were ready to complete the training schedule as well as baseline and post testing program were included in this experiment.

- The subjects with age ranged between 18-20 years were included for this scientific experiment.
The participants were assessed for any health complaints by the physician also for any recent injury. Those who were not fit to undergo experimental intervention were excluded from the study.

Although, researcher tried to convince all the subjects to complete the experimental intervention, however, three participants from group III, one subject from group I and three subjects from group IV were dropped out from the experiment due to various reasons. The main reasons were irregularity, not undergone for post assessment, health problem and not ready to undergo for assessment of some of the variables.

(b) Training interventions and Phases of Experiment

In this experiment of twelve weeks gr. IV was wait list control, group III received breathing exercises as well as pranayama practices, group II was given only pranayama practices while group I was given only breathing exercise. Further, all the participants from all four groups were given a practice of discus throw. They were also introduced regarding rules and regulations of this game and proper techniques of discus throw were also taught to them. The experiment was carried out in following three parts:

- Stage – I: base line assessment for all the parameters under study.
- Stage – II: training intervention of breathing exercises and pranayama practices for twelve weeks, and
- Stage – III: Post assessment.

Baseline Assessment

To record the baseline data all the participants from experimental and control groups were assessed for morphological, psychological, physiological and physical fitness data. Further, performance in discus throw of all the participants was recorded at the baseline.
Training Intervention

The status of morphological, psychological, physiological and physical fitness was recorded at the baseline. After completion of pre test assessment the participants from all the three experimental groups were given respective training intervention for twelve weeks. Whereas the participants from wait list control group were engaged in recreational activities and library reading. The training was imparted for forty five minutes daily further they were given practice of discus throw for thirty minutes. For imparting training intervention special teachers were given responsibility.

Thus, four groups involved in this experiment are as follows:

- Group I – Breathing exercise
- Group II – Pranayama practice
- Group III- Breathing exercise + Pranayama
- Group IV- Control

Post Assessment

The training intervention was for twelve weeks and after completion of intervention all the participants from all four groups were again assessed for morphological, psychological, physiological and physical fitness parameters to record post test data.

Parameters assessed

At the baseline and after completion of twelve weeks of training intervention following tests were conducted by using standard equipments:
1. **MORPHOLOGICAL PARAMETERS**

1.1 Height was assessed by using stadiometer and recorded in centimeters.

1.2 Weight was measured by using digital weighing scale and recorded in kg.

1.3 Body mass index was calculated by using formula i.e. weight divided by height in meter square.

1.4 Arm, Chest, Thigh and Calf girth was measured by using anthropometric tape and data was recorded in centimeters.

2. **PHYSICAL FITNESS PARAMETERS**

2.1 Shoulder strength was assessed by the test of medicine ball throw and data was recorded in centimeters.

2.2 Explosive power of legs was measured by using standing broad jump test and data was recorded in centimeters.

2.3 Strength of abdominal muscles was measured by using sit ups test. Data was recorded in number per minute.

2.4 Flexibility was assessed by using sit and reach test. This test records forward flexibility in centimeters.

2.5 Breath holding time was recorded by using stop watch.

2.6 Balance was recorded in seconds by using balance rail test.

3. **PSYCHOLOGICAL PARAMETERS**

3.1 Sports anxiety (Questionnaire) data in points.

3.2 Mental health (Questionnaire) data in points.

4. **PHYSIOLOGICAL PARAMETERS**

4.1 Resting pulse rate (digital blood pressure monitor) data in beats per minute.
4.2 Blood pressure was measured in mmHg by using digital blood pressure monitor.

4.3 Respiration rate was measured by using stop watch in seconds.

5. PERFORMANCE IN DISCUS THROW

5.1 Discus throw in meters.

The participants undergone above mentioned testing protocol and they were motivated to give their best performance in each of the tests.

Breathing Exercise Protocol

The breathing exercise training protocol followed for group I participants was as follows:

- Blowing a burning candle
- Bubbling of water
- Inhaling through pipe
- Blowing through mouth
- Inhaling through mouth
- Exhaling through nostrils
- Hold the breath after inhaling
- Hold the breath after exhaling

The above mentioned training program was followed for twelve weeks. The intensity of these exercises was increased after completion of each week.

Pranayama Training

Following pranayama practices were imparted for total period of twelve weeks. As it is necessary that before starting pranayama practices few yoga practices are essential, accordingly, basic asanas were also practiced by the participants.
- Deep breathing 10 rounds
- Anuloma-Viloma 10 rounds
- Kapalbhati
- Bhatrika
- Ujjayi
- Sitali
- Sitkari
- Breathing awareness

The pranayama techniques were conducted under the supervision of yoga teacher. The intensity and rounds of pranayama were increased after each week. The duration of training was for twelve weeks. Some of the basic asanas which were introduced for the participants of experimental group were as follows:

- Shavasana
- Crocodile
- ArdhaHALASANA
- Niralambasana
- Naukasana
- Sarpasana
- Paschimottanasana
- Vrikshasana
- Pawanmuktasana
- Viparitakarani
- Matsyasana
- Sarvangasana
- Yoga Mudra

The above mentioned practices were introduced during twelve weeks of training intervention.

**Breathing exercises plus Pranayama Practices**

Following breathing exercise and pranayama practices were as follows:

- Bubbling of water
- Inhaling through pipe
- Blowing through mouth
- Anuloma-viloma
- Kapalabhati
- Bhistrika
- Ujjayi

- Breathing awareness

Finally, after baseline assessment training intervention of twelve weeks and post assessment the recorded data was analyzed using analysis of covariance test followed by post hoc test. The findings of this experiment are summarized as follows:

**Findings**

A) Findings on morphological variables

- “Breathing exercise plus Pranayama practices” showed significant superiority over the “Breathing exercise” (cd - .27, p less than .05) and “Pranayama training” (cd - .30, p less than .05) respectively in reducing Body weight.

- “Breathing exercise plus Pranayama practices” revealed no significant difference in body height in comparison with breathing exercise intervention (comparative
difference- .06) and “Pranayama training” (comparative difference- .8) respectively.

- “Breathing exercise plus Pranayama training” showed significant superiority over the “Breathing exercise” (comparative difference- .26, p<0.05) and “Pranayama practices” (comparative difference- .21, p<0.05) respectively in improving Body Mass Index.

- “Breathing exercise plus Pranayama practices” showed significant superiority over the “Breathing exercise” (comparative difference- .30, p less than .05) and “Pranayama practices” (comparative difference- .26, p less than .05) respectively in improving Arm girth.

- “Breathing exercise plus Pranayama practices” could record significantly higher Chest girth than the “Breathing exercise” (comparative difference- .25, p less than .05) and “Pranayama training” (comparative difference- .24, p less than .05) respectively.

- “Breathing exercise plus Pranayama practices” showed significant superiority over the “Breathing exercise” (comparative difference- .28, p less than .05) and “Pranayama practices” (comparative difference- .25, p less than .05) respectively in controlling Thigh girth.

- “Breathing exercise plus Pranayama practices” showed significant superiority over the “Breathing exercise” (comparative difference- .26, p less than .05) and “Pranayama practices” (comparative difference- .24, p less than .05) respectively in improving Calf girth.

B) Findings on physical fitness variables
• “Breathing exercise plus Pranayama practices” revealed significant superiority over the “Breathing exercise” (comparative difference - .25, p less than .05) and “Pranayama practices” (comparative difference - .24, p less than .05) respectively in improving Shoulder Strength.

• “Breathing exercise plus Pranayama practices” showed significant superiority over the “Breathing exercise” (comparative difference - .28, p less than .05) and “Pranayama practices” (comparative difference - .26, p less than .05) respectively in improving Explosive power of leg muscles.

• “Breathing exercise plus Pranayama practices” revealed significant superiority over the “Breathing exercise” (comparative difference - .29, p less than .05) and “Pranayama training” (comparative difference - .28, p less than .05) respectively in improving Strength of Abdominal Muscles.

• “Breathing exercise plus Pranayama practices” showed significant superiority over the “Breathing exercise training” (comparative difference - .32, p less than .05) and “Pranayama practices” (comparative difference - .29, p less than .05) respectively in increasing Flexibility.

• “Breathing exercise plus Pranayama training” revealed significant superiority over the “Breathing exercise training” (comparative difference -.27, p less than .05) and “Pranayama practices” (comparative difference - .23, p less than .05) respectively in increasing Breath holding time.

• “Breathing exercise plus Pranayama practices” showed significant superiority over the “Breathing exercise training” (comparative difference - .26, p less than .05) and “Pranayama practices” (comparative difference - .24, p less than .05) respectively in increasing Balance.

C) Findings on psychological variables
• “Breathing exercise plus Pranayama practices” showed significant superiority over the “Breathing exercise training” (comparative difference- .31, p less than .05) and “Pranayama practices (comparative difference - .27, p less than .05) respectively in reducing Sports Anxiety.

• “Breathing exercise plus Pranayama practices” showed significant superiority over the “Breathing exercise training” (comparative difference - .37, p less than .05) and “Pranayama practices (comparative difference - .34, p less than .05) respectively in improving Mental Health.

D) Findings on physiological variables

• “Breathing exercise plus Pranayama practices” had lower effect than “Pranayama practices” (comparative difference - .21, p less than .05) and showed significant superiority over the “Breathing exercise training” (comparative difference - .26, p less than .05) in reducing Pulse rate.

• “Breathing exercise plus Pranayama practices” also had similar effect like “Breathing exercise training” (comparative difference- .14, p greater than .05), whereas less than “Pranayama practices” (comparative difference - .30, p less than .05) in controlling Systolic Blood Pressure to the normal level.

• “Breathing exercise plus Pranayama practices” also had similar effect like “Breathing exercise training” (comparative difference - .09, p greater than .05) as well as “Pranayama practices” (comparative difference- .13, p greater than .05) in controlling Diastolic Blood Pressure.

• “Breathing exercise plus Pranayama practices” had lower effect than “Pranayama practices” (comparative difference - .30, p less than .05) and showed similar effect like the “Breathing exercise training” (comparative difference - .15, p greater than .05) in reducing Respiratory rate.
E) Findings on Discus throw performance

- “Breathing exercise plus Pranayama practices” also had better effect than “Pranayama training” (comparative difference - .21, p less than .05) and “Breathing exercise training” (comparative difference - .27, p less than .05) in improving discus throw.

5.2 Conclusion

Within limitations, the present investigation warrants the following conclusions:

1) Only breathing exercise are not helpful for improving all the selected variables associated with performance of discus throw in elite male athletes.

2) Pranayama practices found to be useful for improving almost all the associated parameters needed for success in discus throw in male elite athletes.

3) Combined training i.e., “Breathing plus Pranayama” training could also help the Discus thrower in improving all the associated variables of Discus throwing performance.

4) Separate training interventions viz., combined training (Breathing plus Pranayama) Vs Breathing Vs Pranayama revealed that Pranayama training is the best than the other two interventions for improving the selected variables as well as for enhancing Discus throw performance.

5.3 Recommendation

On the basis of the results and conclusion, the present study drawn the following recommendations:

- Breathing exercises alone should not be recommended for the training schedule of Discus thrower.
The combined training (Breathing exercise plus Pranayama) may be recommended for the Discus thrower for improving associated variables and performance.

Pranayama training alone is sufficient to improve all the selected morphological, psycho-physiological and fitness variables and Discus throwing performance and hence recommended.

Limitations of research work

- The present investigation has been limited to the college level male elite athletes, aged 18 to 20 years, who are specialized in discus throw event.

- Major variables limited for measurements are morphological, physical fitness, psychological, physiological and discus throw performance.

- Due to paucity of time and busy schedule in school, the investigator had to restrict the Yoga training session for only 45 minutes daily.

- Total duration of training for this study was limited for 6 weeks only. Due to paucity of time the researcher could not extend the experimental period.

Future scope

- Many standard training schedules and science based popular techniques are available in the literature of physical education and sports towards improvement of Discus throw performance. In fact, the role of “Pranayama” (a part of Yoga) exclusively for enhancing Discus throw performance is unknown in the research-based literature globally. In this investigation, the researcher proved that “Pranayama training” has an additional advantage especially the athletes participating in power events (i.e., Discus throw) and hence could be
incorporated to enrich the training programme for track and field athletes. The result of this investigation is thought provoking and yielded new ideas for further researches in the field of physical education and sports.

- The finding of this experiment will be able to encourage athletes of track and field event to achieve the needed level of psychological, morphological, physical fitness and physiological parameters to compete international and national competitions.

- The coaches will get readymade scientifically prepared training schedule of pranayama and breathing exercise protocol that can be incorporated in training intervention exclusively useful for discus throwers.