4.0 AIMS AND OBJECTIVES

4.1 AIM

- The primary aim was to explore the effect of yoga on physical fitness among adolescents.

4.2 OBJECTIVES

A) An urgent need for understand the physical fitness status of school going children due to the effect of sedentary life styles and to evaluate the possibility of using pulmonary function as one of the important predictors of physical fitness was need of hour. Hence the objectives were:

a. To evaluate the present status of muscular fitness and ventilatory function using Kraus-Weber Test and mini peak expiratory flow meter in healthy South Indian Children.

b. To understand the relationship between muscular fitness and ventilatory function

B) With yoga being accepted for use in schools there is a need for developing a scientifically acceptable standardized tool to assess the progress of their practices that can be used in yoga classes for children that keeps their interest going. Need simple tools to assess the progress when we enter into service programs. Instruments (although portable) for assessing the lung function may not be available or cost effective in mass yoga programs. Hence the objective was:
c. To validate the acceptability of *bhramari time* by checking its correlation with PEFR in healthy South Indian Children.

C) Earlier studies on yoga for adolescents have shown the benefits mainly on physical strength and performance, however, there are no studies that have looked at physical fitness between experienced and non-experienced practitioners. Hence the objectives were:

d. To compare physical fitness and ventilatory functions between experienced and non-experienced practitioners of yoga.

D) Previous studies has yoga training enhance an individual's physical fitness. No studies that have looked at effect on short term intense training on minimum muscular fitness, flexibility, and pulmonary functions.

e. To assess the effect of intensive short term yoga based personality development program on physical fitness in healthy children.

f. To investigate the influence of yoga practice on the physical fitness and ventilator function

E). There are several types of yoga that are evolving as its popularity and applications are increasing. Children seem to enjoy repetitive practice of squatting salutation which is a traditional practice in India during the festival of worshipping lord Ganesha (elephant headed GOD), believed to bestow higher cognitive abilities. Hence the objective was:

g. To understand the immediate effect of yogic squat on selective attention in adolescents.
4.3 RESEARCH QUESTIONS, HYPOTHESES AND NULL HYPOTHESES

The following research questions and hypotheses were addressed through five different studies:

*Question -1: Is there a relation between muscular fitness and pulmonary function?*

Hypothesis 1: Minimum muscular fitness may have positive relationship with peak expiratory flow rate.

Null Hypothesis 1: Minimum muscular fitness may not have positive relationship with peak expiratory flow rate.

*Question -2: Can bhramari time be an acceptable objective test of pulmonary function?*

Hypothesis 2: Higher levels of *bhramari time* will be positively related to PEFR which is an established test of pulmonary function.

Null Hypothesis 2: Higher levels of *bhramari time* will not be acceptable as a replacement for PEFR which is an established test of pulmonary function.

*Question - 3: Do long term regular practitioners have better physical fitness than novices?*

Hypothesis 3: Regular practitioners would have higher levels of physical fitness compared to novices.

Null Hypothesis 3: Regular practitioners would not have higher levels of physical fitness compared to novices.
**Question - 4: Can a short term intensive summer yoga camp help in improving fitness in children?**

Hypothesis 4: Short term intensive summer yoga camp may enhance fitness in children

Null Hypothesis 4: Short term intensive summer yoga camp may not enhance fitness in children

**Question -5: Can yogic squatting salutation improve cognitive ability in children?**

Hypothesis 5: Immediate effect of yogic squatting salutation may improve cognitive ability.

Null Hypothesis 5: Immediate effect of yogic squatting salutation may not show improvement in cognitive ability.

**4.4 DEFINITIONS OF KEY TERMS**

Definitions of terms are provided below to clarify the purpose of this study:

*Physical fitness* refers to the maximum capacity that people have or achieve while they perform physical activity that can be measured as the level of strength and flexibility of the muscular groups in different body parts. For the purposes of this study, minimum muscular fitness were measured using six tests of minimum muscular fitness for children called Kraus-Weber test (KW). The battery evaluates strength and flexibility of trunk and leg muscles.

*Spinal flexibility* is defined as the flexibility of the lower back and hamstring muscles. For the purposes of this study, Sit-and-reach test (SAR) was used to determine spinal flexibility.
Ventilatory function as measured by PEFR is defined as the maximum flow achieved during expiration delivered with maximal force starting from the level of maximal lung inflation. For the current study, PEFR was measured through mini hand held PFR meter.

Handgrip Strength is the force applied by the hand to pull on or suspend from objects and the maximum isometric strength of the hand and forearm muscles. For the present study, Handgrip Strength was assessed through the hand grip dynamometer.

Cognitive ability is defined as integration of complex neuropsychological processes, including visual scanning, mental flexibility, sustained attention, psychomotor speed, and speed of information processing. For the purpose of the study Digit letter Substitution test, a speed dependent task that requires the participant to match particular letters to digits within a specified time period has been used.

Yoga is defined by sage patanjali as mastery over the modifications of the mind (chitta vrtti nirodhah). This can be achieved by various components such as āsana (seat or meditative posture), prāṇāyāma (regulation of breath), pratyāhāra (withdrawing the mind from the objects of sense experiences), dharana (confinement of the mind to one point or one object or one area) and dhyana (relaxed dwelling of the mind in a single thought with awareness while practicing unbroken concentration). Further, the practice of yoga involves ethical principles of self restraints (Yama) and observances (Niyama).

For this study, we considered the subject as a senior Yoga practitioner when the was practicing all components or individual techniques of yoga (either taking classes or practicing at home) at least once a week for a minimum of two months within the past 6 months.
Bhramari time is defined as the time taken for slow complete exhalation while making a low pitched humming sound like that of a female honey bee. For the present study, the time duration in seconds using a stop watch was documented by the researcher while the student does complete exhalation with Bhramari chanting after deep inhalation.

4.5 ETHICAL CONSIDERATION

Participants were healthy school adolescents who attended Yoga based Personality Development Camp (YPDC) in summer holidays in the serene campus of S-VYASA Yoga University, Bangalore. Signed informed consent was obtained from the parent or guardian of the child at the time of registration, after they had read the proposal that involves non-invasive data collection methods and risks free intervention. All procedures were reviewed and accepted by the institutional ethical committee of S-VYASA University. The adolescents were explained in detail about the nature of the study and the voluntary nature of participation and were not provided with any incentives for their participation.