CHAPTER III

METHODOLOGY

The study analyzes the effect of physical education teachers’ training program on morphological, physical fitness and physiological parameters. Although standard procedure was followed to conduct this study, this chapter describes the method of research, nature of the design, population and sample, tools used for research, apparatus or instruments employed statistical tools and procedures systematically.

3.1. Research Design

This is an experimental research with repeated measures design\(^1\), which provides a systematic and scientific method for testing the proposed hypothesis.

3.2. Subjects

Ninety teacher trainees (n=90; male=52 & female=38), who were studying in Maharashtra Mandal’s, Chandrashekhar Agashe College of Physical Education, Pune, during year 2007-08, were selected as subjects (Purposive sample). All the teacher trainees were perusing Bachelors Degree in Physical Education and their age was ranged from 21 to 30 years.

Inclusion & Exclusion Criteria

The reliability of subjects depends on their selection criteria. The criteria for inclusion and exclusion of the subjects were as follows:

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Students admitted to B. Ed (Physical Education) course for the year 2007-08 were included in this study.

The teacher trainees who are expected to remain present till the experimental trials are finished were incorporated in this study.

The teacher trainees irrespective of any communities were included in this study.

The teacher trainees aged below 21 and above 30 years were excluded from this study.

The teacher trainees suffering from known serious health problems were excluded. Moreover, the teacher trainees having incapacitating physical illness ruled out by clinical investigation were excluded prior to the study.

**Drop outs**

Out of 90, the data of 8 teacher trainees were not included because of their absence during the days of data collection. Thus, finally 82 teacher trainees (i.e., 44 males & 38 females) remained in this study.

**3.3 Experimental Design**

As stated earlier the experimental design followed for this research study was single group repeated measures design. The experiment was planned in five phases.

- Phase – I: Pretest
- Phase – II: 1st Phase of Training
- Phase – III: Mid test,
- Phase – IV: 2nd Phase of Training
- Phase – V: Post Test
Pre Test (Phase –I)

As the purpose of this study was to measure the selected morphological, physical fitness and physiological parameters of physical education trainees, standard tests were administered to record pre test data.

Training (Phase – II)

After the pre testing was over, all the teacher trainees participating in this study underwent practical training program from July to November 2007 as approved in the course of bachelor’s degree of physical education, except Sundays and holidays.

Mid Test (Phase III)

During the practical training program, mid test in November 2007 was conducted for all the selected morphological, fitness and physiological parameters on the teacher trainees participating in this study.

Training (Phase IV)

After completion of mid test the teacher trainees again underwent practical training program from November 2007 to March 2008.

Post Test (Phase V)

During March 2008 all the selected morphological, physical fitness and physiological parameters were again assessed to record the post test data.
3.4 Variables for the Study

To obtain pertinent information about the physical education training program on selected morphological, physical fitness and physiological parameters of teacher trainees, the following dependent and independent variables were selected.

3.4.1 Dependent variables & Tools of Measurement

Before and after experiment, following variables on all the teacher trainees were assessed, with the help of some standard test items as given in table 3.1.
Table No 3.1
Dependant Variables & Tools Used in the Study

<table>
<thead>
<tr>
<th>Variables</th>
<th>Tools/Method Used</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Measure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Nearest to)</td>
</tr>
<tr>
<td><strong>Morphological Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>Stadiometer</td>
<td>0.01 cm.</td>
</tr>
<tr>
<td>Weight</td>
<td>Weighing machine</td>
<td>0.50 kg.</td>
</tr>
<tr>
<td>BMI</td>
<td>Body fat monitor</td>
<td>0.01 index</td>
</tr>
<tr>
<td><strong>Physical Fitness Parameters</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiorespiratory endurence 12 min run/walk</td>
<td>0.05 M</td>
<td></td>
</tr>
<tr>
<td>Muscle strength</td>
<td>Hand grip dynamometer</td>
<td>0.05 Kg.M.</td>
</tr>
<tr>
<td>Muscle endurance</td>
<td>Push up</td>
<td>1 No./min.</td>
</tr>
<tr>
<td>Trunk flexibility</td>
<td>Sit &amp; reach</td>
<td>0.05 mm.</td>
</tr>
<tr>
<td>Agility</td>
<td>4 x 10 M run</td>
<td>0.01 sec.</td>
</tr>
<tr>
<td>Power</td>
<td>Standing broad jump</td>
<td>0.05 cm.</td>
</tr>
<tr>
<td>Speed</td>
<td>50 M dash</td>
<td>0.01 sec.</td>
</tr>
<tr>
<td>Fat %</td>
<td>Omron Body fat monitor</td>
<td>0.05 percent</td>
</tr>
<tr>
<td><strong>Physiological Parameters</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lung function test</td>
<td>Shellar's automatic Gas analyzer</td>
<td></td>
</tr>
<tr>
<td>Pulse rate</td>
<td>Omron Digital blood pressure monitor</td>
<td>1 beat/min</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>Sphygmomannometer</td>
<td>0.5 mm.Hg.</td>
</tr>
<tr>
<td>Cardiac function</td>
<td>Shellar's automatic ECG analyser</td>
<td></td>
</tr>
</tbody>
</table>
3.4.2 Independent Variable

One independent variable viz, practical course of study of undergraduate level physical education teachers’ training program as per the syllabi of University of Pune\(^2\), was included in this study.

3.5 Facilities Utilized

Instrumentation

Some of the instruments available in the Research Laboratory of the Maharashtra Mandal's Chandrashekhar College of Physical Education, Pune were utilized. However, the researcher purchased raw material required for the testing process. Reliability and validity of the instruments were checked as per the standard protocol by the respective company’s technical specifications. However, all the instruments had accepted level of reliability and validity.

Man power

For the testing procedure the researcher had taken help of expert MD doctors having research background, while conducting physiological tests. The expert teachers, the senior M. Ed (Physical Education) students and physical education professors assisted while conducting physical fitness tests. The tester’s reliability and validity was also checked which was found satisfactory.

Financial support to complete this study

Financial support was taken from parents, husband and own earning.

3.6 Description of Tests Measuring Dependent Variables

3.6.1 Morphological Variables

1) Height

*Purpose:*
To measure the Standing Body Height of the teacher trainee.

*Facilities and Equipments:*
Wall perpendicular to a flat surface, a measuring tape and scale.

*Procedure:*

Each trainee, one by one, stands on the flat surface adjacent to the perpendicular wall where the measuring tape has been fixed. Trainees stand without shoe or chappals in front of the wall (fixed with scale)contracting his/her heels, buttocks and upper back and back of the head making firm contact with the scale. A foot scale was placed on the trainees’ head that forms right angle with the measuring wall tape. Keeping the wall at its position, the teacher trainee was instructed to come out of the wall and the score of height of each trainee was recorded.

*Score:*

The score was recorded on Centimeters (cm) least count to 0.1cm.

2) Weight

*Purpose:*
To measure the body weight of the teacher trainee.

*Facilities and Equipments:*

Weighing Machine (Portable).
Procedure:

Each Trainee, one by one, stands on the flat surface of the weighing machine, which was kept on a hard surface. Trainees were not allowed to wear shoes or chappals while standing on the machine. They were then instructed to stand erect by keeping equal weight on both the legs and by looking towards front direction. They were restricted to move body while standing on the machine. Keeping the machine at its position the investigator took the reading from the pointer associated with a scale indicating body weight.

Score:

The score was recorded in Kilograms (Kgs).

3) BMI

Purpose:

The most widely used method to gauge obesity is the body mass index (BMI).

Equipments:

Equipments are same as used to measure height and weight.

Procedure:

The height and weight of the teacher trainee was taken as previously mentioned, then the ratio of this two variables are calculated according to the formula i.e. ratio of teacher trainees’ body weight to the square of teacher trainees’ height.

Score:

The score was recorded in kg per meter square (kg/m^2).
3.6.2 Description of Physical Fitness Tests

1) 12 Min Run & Walk

**Purpose:**

The purpose of the distance run is to measure maximal functional capacity and endurance of cardio-respiratory system.

**Equipments:**

Stop watch, Score card, Pencils, 400 meter track, or any other flat measured surface.

**Procedure:**

The trainees were instructed to run as fast as possible, with the beginning of the signal (i.e. a whistle blow). They should continue running for 12 minutes until they get the second stop signal (second whistle sound). As the second signal blows, the examiner noted the exact distance that was covered during this time, and noted it. Walking although permissible should be discouraged as the sole purpose of this test is to measure the maximal capacity.

**Scoring:**

The distance covered by each trainee within 12 minutes is scored to the nearest 0.5 meters.

2) Hand Grip Dynamometry

**Purpose:**

To measure the grip strength of the trainee. This in fact predicts the level of strength of one's upper arm.
Facilities and equipment:

Grip dynamometer (Portable).

Procedure:

The instrument’s scale was set to zero prior to measurement. The instrument was kept on the palm of the trainees’ strong hand. The trainee took this instrument in his/her grip, stand on a comfortable body position by keeping the legs apart from the body, and slightly bend the body forward. After completion of this posture, after holding the breath, the trainee was allowed to exert the maximum pressure on the bars of the instrument in squeezing the grip only once. For other trials, again the instrument was set to zero and then the same procedure was repeated. Like this, three trials were taken for consideration.

Score:

The needle of the instrument indicates the score, which was recorded in Kg-M.

4) Push Ups

Purpose:

To measure arm and shoulder strength.

Equipments:

A mat and a watch.

Procedure:

The teacher trainee lies face down on the floor with the body straight, arm bent, and hands flat on the floor beneath the shoulders. Pushes upward to a straight arm position and lowers the body until the chest touches the floor and
repeats the exercise as many times as possible, without rest. The body must stray rigid (not sag or pike upward) throughout the test.

**Score:**

The score is the number of correct push-ups completed in one minute.

5) Sit and reach

**Purpose:**

The sit and reach test is designed to evaluate the flexibility of the lower back and posterior thigh.

**Equipment:**

The test apparatus consist of specially constructed box with a measuring scale where 23 cm is at the level of the feet.

**Procedure:**

The examinee must remove their shoes before starting the test. The examinee sits in front of the test apparatus with feet flat against the end board. The knees should be fully extended and the feet, shoulder width apart. To perform the test, the examinee extends the arm forward with one hand placed on top of the other. The examinee reaches forward, palms down along the measuring scale on the testing apparatus. The reach is repeated three consecutive times and their average is taken into consideration. The maximum reach is held for one second. The distance of the maximum reach is recorded as the test score.

**Scoring:**

The score, measured to the nearest centimeter, is the most distant point reached in the three trial average. The finger tips of the both hands should reach this point. If the reach of this two hands are uneven, then the test should be done again.
6) 4 X 10 M Run

*Purpose:*

To measure speed and agility.

*Equipments:*

Two lines parallel to each other are placed on the floor 30 ft apart, 2 blocks of wood, 2x2x4 inches and a stop watch are needed.

*Procedure:*

The teacher trainees stands at the lines with 2 blocks at the other line, on the signal ‘to start’ the teacher trainees run to the blocks, take one and returns to the starting line and places the block which he carries across the starting line on his way back. Two teacher trainees could run at the same time if two timers were available, or if one test administrator has split timer and of course if, there are two sets of blocks. Two trials were permitted It was instructed to the teacher trainees that on the signal ‘go’ they must run as fast as possible to the next line and pick up a block. They should not throw the blocks instead place the block on the floor. They will return to the second block and this time they may run across the starting line as fast as they can without placing the blocks on floor.

*Score:*

The score is the elapsed time recorded in seconds and 10 of the seconds for the best of 2 trials.

7) Standing Broad Jump

*Purpose*

To measure power.

*Equipments:*

A measuring tape and space on the floor.
**Procedure:**

The teacher trainee stands behind take off line with his feet several inches apart. Before jumping the teacher trainees dips at the knee and swing the arms backward. He then jumps forward by simultaneously extending the knees and swing the arms forward. Three trials were permitted. Measurement was from the closest heel mark to the take off line.

**Score:**

The score was the distance between the take off line and the nearest point where any part of the teacher trainee's body touches the floor. It was measured in feet and inches to the nearest inch only the best trial was recorded.

8) **50m Dash**

**Purpose:**

To measure speed.

**Equipments:**

An area or track, football field or play ground with starting line and a finish line, two stop watches or a split second timer.

**Procedure:**

The teacher trainees stand at the starting line in a alert position. On the signal ‘to start’ they start running as fast as possible and will finish the total 50 m distance that is marked before them. The observer will start the timer as soon as the he give the start signal and will stop the timer when the feet of the teacher trainee touches the finishing line. Two teacher trainees can do the test simultaneously under one observer if he has two stop watches or a split timer.

**Score:**

The score is the shortest time (in seconds) taken by the teacher trainee to finish 50 m. Two trials were permitted.
9) Body Fat Percentage

Purpose:

This test is used to assess the percentage of fat in the body of an individual.

Equipment:

Omron Fat monitor (HBF-402) is used for direct measurement. The instrument has two handles to catch hold the instrument and a monitor which displays digitally the score.

Procedure:

The trainee was instructed to stand in a normal standing position with legs apart 8 to 10 inches. Eyes towards front, spine straight, and hand by the side of the body. Then the age in years, height in centimeters, body weight in kilograms and sex of the trainee was feed through the available keyboard. When the instrument indicates its readiness, the trainee was directed to hold the handles of the instrument with the two respective hands. Hands are kept straight in front at the shoulder level so that the eyes can easily read the monitor display. The finger grip should be very firm in such a way that the instruments sensor can easily sense the skin voltage. Generally within 30-40 seconds the monitor displays the body fat percentage score. If there is any display with error signal, the data on age, height, body weight, sex (M/F) are to be entered again through the keyboard and the process to be repeated again till the monitor displays the score in body fat percentage.

The proper method for measuring the body fat percentage with this instrument plays very important role. The following points are to be remembered:

- Check the battery before making it ready for measurement.
- Get adjusted to this instrument and its functional procedure.
• Keep ready the data, such as age, height, weight, and sex of each volunteer before measuring the volunteers' body fat percentage.

• Take care of the alignment of each body part for an ideal standing posture. Finger grip should be checked so that they are kept with proper alignment as available in the handles of the instrument.

• Read the monitor’s display for recording the score.

**Score:**

The percentage of the body fat as registered on the dial of the instruments monitor is the score. Each measurement is taken three consecutive times and the average of the three scores is the final score.

### 3.6.3 Description of Physiological Tests

1) Lung Function Test

**Purpose:**

Lungs through the process of ventilation replenish the gas in the alveoli. Measurements of lung function in common diagnostic use consist of quantification of the gas volume contained in the lungs under certain circumstances and the rate at which gas can be expelled from the lungs.

**Equipments:**

Shellar’s automatic Gas analyzer (Spirometer).

**Procedure:**

The lungs function ability was measured as follows:

1. The function test key (FVC or SVC) was pressed. The relevant keyboard lamp lights and the corresponding coordinate presentation appeared on the display.
2. The START key was pressed. The flow sensor was held quite still and no air was breathed into the device for at least one second before and after the START key was pressed. The message "READY FOR MEASUREMENT" appeared on the display together with a volume counter graph for the value. As soon as the teacher trainee started to breathe into the flow sensor, the unit begins to record the expiratory flow. The corresponding curve was represented on the display. The break-off point for the expiration measurement was reached automatically. To carry out the test for Forced Vital Capacity (FVC), "FVC" key was pressed and the corresponding coordinate presentation appeared on the display. The teacher trainee exhaled as quickly as possible from the time of starting the test. The exhalation was immediately followed by a maximum inhalation. Slow Vital Capacity (SVC) Test the teacher trainee breathed normally 3 times and then inhaled maximally to total lung capacity and then expired maximally.

3. STOP key was pressed on completion of the test.

4. Steps 2 and 3 were repeated until three measurements have been taken.

**Score:**

The values and the graphs of the measurements are given as printout pages. All the scores were measured in Lit. / minutes.

2) Pulse rate

**Purpose:**

The expansion and elongation of arterial walls passively produced by the pressure changes during systole and diastole of ventricles. It is an indicator of hemodynamic condition of a person.

**Equipments:**

A timer.
Procedure:

The teacher trainee was asked to lie down in supine position. Then to examine the observer places her three fingers i.e. index, middle and ring finger on the radial artery. The hand and forearm of the teacher trainee should be in semi prone position. The index finger is used to fix the radial artery; the middle finger is used to feel the palpation and the ring finger to control the volume of flow of blood in the radial artery.

Score:

The number of beat per minute recorded.

2) Blood Pressure

Purpose:

To know the pre recruitment cardio vascular condition of the teacher trainee.

Equipments:

Sphygmomanometer and Stethoscope.

Procedure:

The teacher trainee was made to lie for few minutes before starting the test. The Sphygmomanometer cuff is wrapped around the mid arm, so as it is not too tight or not too loose. The sphygmomanometer cuff pressure is increased gradually till 200mm Hg. The pressure is gradually reduced till the pulse is felt which is the systolic B P(palpatory method), then the cuff is fully deflated. After some time the pressure is increased as before and reduced gradually, in the mean time the stethoscope is put over the Brachial artery , the first sound heard as the mercury falls is the systolic BP and when the sound disappear it is marked as diastolic BP.

Score:

The systolic and diastolic pressures measured in mm Hg.
4) Electrocardiography (ECG)

**Purpose:**

The electrocardiogram (ECG or EKG) is a graphic recording of electric potentials generated by the heart. The signals were detected by means of metal electrodes attached to the extremities and chest wall and are then amplified and recorded by the electrocardiograph. ECG *leads* actually display the instantaneous *differences* in potential between these electrodes. Thus the cardiac condition could be known.

**Equipments:**

Shellar’s automatic ECG analyser

**Procedure:**

The teacher trainee was made to lie for few minutes before starting the test. Then the limb leads (Right and Left wrist and left leg ankle) and then the chest leads (V1 to V6) were attached as follows:

- V1: Fourth intercostals space in the right, parasternal region
- V2: Fourth intercostals space in the left, parasternal region
- V3: In between V2 and V4.
- V4: Fourth intercostals space in the left, mid clavicular line
- V5: Fourth intercostals space in the left, anterior axillary line
- V6: Fourth intercostals space in the left, mid axillary line.

**Score:**

The recording shows the electrical waves as P,Q,R,S,T and U are noted.

3.7 Reliability of Data

Reliability of data depends upon the reliability of tests, reliability of teacher trainees, reliability of tools and testers’ competency.
3.7.1 Testers’ Competency

Since there were many variables, the researcher had taken assistance from professionally qualified physical education teachers, professor and MD doctors. Since the investigator collected the data by administering different tools, however prior to conducting the actual test, five teacher trainees were chosen randomly and tests were taken on them by the research scholar, the assistants under identical conditions. This establishes testers’ competency.

3.7.2 Reliability of Tests

Although the tests are selected in this study are standard and they have accepted level of reliability and validity, the investigator took special effort to see the same. Before the actual data collection on large sample, 5 teacher trainees were tested twice a month\(^3\) interval on the different test items as selected in this study and the reliability coefficient for all the tests ranges from 0.75 to 0.86 (\(p<0.01\)).

3.7.3 Reliability of Tools

The tools used in testing variables are standardized. Further, all the instruments used were taken from the research laboratory of Maharashtra Mandal’s Chandrasekhar College of Physical Education, Pune. The instruments were in working condition as they had been used regularly for college research work. Still, they were tested and standardized as per the company’s protocol before their use and found reliable and valid.

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3.8 Procedure of Testing

3.8.1 Preparation of Testing

(A) Official Records

All the tests performed were recorded on sheets as shown below:

### Table-3.2

**Sheet for recording Fitness Parameters**

<table>
<thead>
<tr>
<th>Sl no of subjects</th>
<th>Fat%</th>
<th>12min w/r</th>
<th>Hand grip</th>
<th>Push ups</th>
<th>Sit &amp; reach</th>
<th>Shuttle run</th>
<th>SBJ</th>
<th>50m Dash</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table-3.3

**Sheet for recording Physiological Parameters**

<table>
<thead>
<tr>
<th>Sl no of subjects</th>
<th>Height</th>
<th>Weight</th>
<th>BMI</th>
<th>Pulse</th>
<th>BP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sys</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ECG Recordings and Pulmonary Function Tests were tabulated later as the recorded version came printed automatically through the instrument. Each such sheet was prepared thrice one for pre test, one for mid test and one for the post test.
(B) Checklist of the equipments

Stop watches or split second timer, A measuring tape, 2 blocks of wood each 2x2x4 inches, specially constructed box with a measuring scale where 23 cm is at the level of the feet, Grip dynamometer (Portable), Score cards, Pencils, Omron Fat monitor (HBF-402), Shellar’s automatic ECG analyser, Sphygmomanometer and Stethoscope, Shellar’s automatic Gas analyzer (Spyrometer), Weighing Machine (Portable), Wall perpendicular scale.

(C) Ground Marking

Ground marking was required for some selected tests and they are described while discussing the tests in the description of the tests. Those tests are 12 min walk and run, Shuttle run, Standing broad jump and 50 min Dash.

3.8.2 Procedure & Administration of Tests

Permission from the Principal of Maharashtra Mandal’s Chandrasekhar Agashe College of Physical Education was taken for the study to be done on the B. Ed (Physical Education) teacher trainees. The score sheets were prepared after discussing with the guide and the college faculty. Equipments that would be required were listed. Equipments were gathered from the Laboratory of Maharashtra Mandal’s Chandrasekhar Agashe College of Physical Education, Pune. After taking the instruments and buying the raw materials, each instrument was checked for proper functioning and standardization. The functional status of each instrument was verified before use. Assistants and medical doctors who helped for data collection were properly informed and trained. Data was collected in three phases. After completion of data collection, data was recorded properly and preserved systematically for data analysis and interpretation in research report writing. The testing schedules of the variables have been presented in Tables 3.4. while the details are presented in Appendix no. IV, V and VI.
Table-3.4
Variables Testing Schedule

<table>
<thead>
<tr>
<th>Test</th>
<th>From</th>
<th>Upto</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Test</td>
<td>2 July</td>
<td>8 July</td>
</tr>
<tr>
<td>Mid Test</td>
<td>26 November</td>
<td>2 December</td>
</tr>
<tr>
<td>Post Test</td>
<td>4 March</td>
<td>10 March</td>
</tr>
</tbody>
</table>

Teacher trainees field activity schedule during the analysis period

The practical training program conducted by Maharashtra Mandal's Chandrasekhar Agashe College of Physical Education, which the trainees underwent during the research period was as per the B. Ed (Physical Education) syllabus 2006, University of Pune, is as follows:

**Practical Training Program**

The practical training program conducted by Maharashtra Mandal's Chandrasekhar Agashe College of Physical Education was followed. For the experimental purpose the practical training program was divided into two training phases.

<table>
<thead>
<tr>
<th>Phases</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training Phase-1</td>
<td>July. to Nov. (12 activities)</td>
</tr>
<tr>
<td>Training Phase-2</td>
<td>Nov. to March (12 activities including specialization)</td>
</tr>
</tbody>
</table>

*The details of the activities have been presented in APPENDIX-I*
3.9 Response of College Faculty and Management

The response of the college to the proposed tests was encouraging. The response of the principal, teachers and all academic and non academic staffs were inspirational.

3.10 Response of Subjects

The response of the teacher trainees was unbelievably good, though the response of the trainees for the 12 min walk and run was very poor as compared to the other tests.

3.11 Statistical Techniques Used

Primarily the data were processed through descriptive statistics. Further, Repeated measures ANOVA followed by Newman Kules post hoc test were employed to determine the efficacy of training intervention (i.e., implementation of course of bachelor of physical education) on the selected morphological, physical fitness and physiological parameters.