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CHAPTER – III
METHODOLOGY

In this chapter the subject, criterion measure, instruments and tool used, procedure for collecting data and procedure for analysis of data have been presented.

3.1 THE SUBJECT

Six (6) male artistic gymnasts with average age of 18.17 years, average height of 160 cm and average body weight of 51.17 kg were selected as subjects for the present study. They were active gymnasts and were selected through “Talent search selection trial” by Sports Authority of India (SAI), Netaji Subhash Eastern Centre, Salt Lake City, Kolkata, West Bengal. They had been trained there as the trainee boarders for five years by qualified SAI coaches. They all had ten years of training experience. All of them had participated in the Men’s Senior level National Artistic Gymnastics competition as the members of West Bengal Gymnastics Team and won medals. One of them was an International level competitor who had represented India in Indo-Bangladesh International Gymnastics Tournament, 2010 and won Bronze medal. They all were born and brought-up in the middle class families and had learnt preliminary gymnastics from nearby gymnastics clubs in their society. The occupations of the guardians of the two players were service and the other four players were business but they all had motivated their wards to be successful gymnasts.
Figure 3.1 shows the subjects of the present investigation.

![Fig. 3.1: The Subjects](image)

### 3.2 CRITERION MEASURE

The purpose of this study was to analyze the take-off action for different gymnastics events on the basis of laws and principles of kinematics. Selected kinematic parameters for study and for analysis were:

i) Take-off time;

ii) Height of the Main body (Cg) at Touch-down, Amortization and Push-off phase of Take-off;

iii) Body lean at Touch-down and Push-off phase of Take-off;

iv) Knee angle at Touch-down and Push-off phase of Take-off;

v) Horizontal velocity of the Main body (Cg), Arm (Elbow joint) and Swing leg (Knee joint) at Touch-down and Push-off phase of Take-off;
vi) Vertical velocity of the Main body (Cg), Arm (Elbow joint) and Swing leg (Knee joint) at Touch-down and Push-off phase of Take-off;

vii) Angular velocity of the Main body (Cg) during Push-off phase of Take-off;

viii) Greatest height of the Main body (Cg) during flight after Push-off phase of Take-off.

3.3 INSTRUMENTS AND TOOLS USED

For collection and analysis of data the following instruments were used:

i) A Video camera was used for recording movements. This camera was manufactured by Sony, Japan;

ii) The recorded movements were frame to frame analyzed by Silicon coach Lite Live online software and Adobe Premiere Pro CS3 (3.0.0) software;

iii) A double flexed standard Floor Exercise arena manufactured by Gymnova, USA was used for take-off of Backward Salto;

iv) A Springboard and Table Vault, both manufactured by Gymnova, USA were used for take-off of Handspring Vault;

v) A Stadiometer was used for measuring height in meter.

vi) A Weighing machine was used for measuring weight in kg.

vii) Necessary materials and equipments were used like measuring scale, protector, pointer of joints, graph papers, one meter reference stick used as reference frame, running mats and 5 cm and 10 cm landing mats for Table Vault.
Gymnasium and apparatus of Indoor Training Centre of Netaji Subhas Eastern Centre at Sports Authority of India (SAI), Kolkata, has been shown in figure 3.2.

\[ \text{Fig. 3.2: Gymnasium and Apparatus of Indoor Training Centre, Netaji Subhas Eastern Centre, Sports Authority of India, Kolkata} \]

3.4 PROCEDURE FOR COLLECTING DATA

The subjects of the study were at first assembled in a hall and explained the purpose of the study. There anthropometric measurements were taken at first. Subsequently, the take-off actions of the subject were recorded using a Video camera. Finally, the recorded movement of the subjects were analyzed by using Silicon coach Lite Live online software and Adobe Premiere Pro CS3 (3.0.0) software.
3.4.1 Procedure for Measuring Parameters

Measurement of height of the subjects was important in this study because vertical height of main body (Cg) during flight and after Push-off was measured as a kinematic parameter, as well as weights of the subjects also a parameter which helped to gain their velocities.

**HEIGHT:** The distance between the surface of the platform and the vertex was measured as the height of the subject and expressed in centimeters (cm).

**WEIGHT:** For measuring the weight, a portable weighing machine was used. Each subject was asked to stand bare footed on the platform of weighing machine in erect posture. The weight was recorded in kilogram as indicated by the digital recording of the machine.

3.4.2 Scheme of Recording of Movement

Scheme of recording of movement has been shown in figure 3.3.

i) Backward Salto
ii) Handspring Vault:

Fig. 3.3: Recording of Movement of Take of actions in i) Backward Salto and ii) Handspring Vault

3.4.3 Measurement of Kinematic parameters

Videographic technique was used to measure selected kinematic parameters. This was done in two successive phases. In first phase the recording of movement was done by a Video camera. This recording was done by following all the principles of scientific recording. The camera was placed on the left side of the subject. The lateral distances were 11 m
for Floor Exercise and 6 m for Table Vault. Height of the camera lens was 1 m in both the axes. The camera axis was positioned at the perpendicular direction of the movement.

In second phase recorded movement was displayed by a laptop. Silicon coach Lite Live online software and Adobe Premiere Pro CS3 (3.0.0) software were used to observe the display from frame to frame. Kinogram of each execution was developed by Silicon coach Lite Live online software and by Adobe Premiere Pro CS3 (3.0.0) software.

3.5 PROCEDURE FOR ANALYSIS OF DATA

Obtained data were analyzed using Microsoft Office Excel 2007 for statistical procedure. The mean and Standard deviation were calculated as the measure of Central tendency and Variability respectively and ‘t’ test was calculated as the measure of Difference between two mean.