CHAPTER-3

Research Design and Methodology

This chapter describes the research design and specific methodology to be adapted for this study. The chapter is organized in sections covering:

i. Selection of Subjects

ii. Selection of Variables

iii. Description of Tests

iv. Design of the Study

v. Statistical Techniques Employed
For the purpose of the present study, One Hundred Twenty Two (N=122), male inter-college level fencing players between the age group of 18-25 years (Mean ± SD: Age 20.31±1.82 years, Body Height 160.62±7.61 m, Body Mass 55.07±8.13 kg) were selected. The subjects were purposively assigned into three groups:

1. Group-A: Guru Nanak Dev University, Inter-College Fencers (n1=38)
2. Group-B: Punjabi University, Inter-College Fencers (n2=48)
3. Group-C: Panjab University, Inter-College Fencers (n3=36)

To attain the objectives of the study researchers used purposive sampling technique. Researchers informed about the objectives and protocol of study to all the subjects. And subjects deliberitry to involve in the part of study.

Table 1: Subject’s Demographics of Guru Nanak Dev University Inter-College Fencers (n1=38), Punjabi University Inter-College Fencers (n2=48) and Panjab University Inter-College Fencers (n3=36).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Total N=122</th>
<th>Guru Nanak Dev University, Fencers (n1=38)</th>
<th>Punjabi University, Fencers (n2=48)</th>
<th>Panjab University, Fencers (n3=36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foil (F)&lt;sup&gt;1&lt;/sup&gt;</td>
<td>21.24 ± 1.93</td>
<td>21.67 ± 1.497</td>
<td>21.36 ± 2.157</td>
<td>21.17 ± 2.142</td>
</tr>
<tr>
<td>Sabre (S)&lt;sup&gt;1&lt;/sup&gt;</td>
<td>173.3 ± 0.98</td>
<td>173.5 ± 1.002</td>
<td>173.4 ± 1.025</td>
<td>173.1 ± 1.14</td>
</tr>
<tr>
<td>Epee (E)&lt;sup&gt;1&lt;/sup&gt;</td>
<td>72.13 ± 1.14</td>
<td>72.09 ± 1.128</td>
<td>72.27 ± 1.044</td>
<td>72.17 ± 1.1043</td>
</tr>
</tbody>
</table>

- Foil (F): 12
- Sabre (S): 11
- Epee (E): 15
- Foil (F): 18
- Sabre (S): 14
- Epee (E): 16
- Foil (F): 12
- Sabre (S): 13
- Epee (E): 11
Figure-1: Subject’s Demographics of Guru Nanak Dev University Inter-College Fencers (n₁=38), Punjabi University Inter-College Fencers (n₂=48) and Panjab University Inter-College Fencers (n₃=36).

**SELECTION OF VARIABLES**

“A feasibility analysis as to which of the variables could be taken up for the present investigation, keeping in view the availability of tools, adequacy to the subjects and the legitimate time that could be devoted for tests and to keep the entire study unitary and integrated was made in consultation with experts. With the above criteria’s in mind, the following variables were selected for the present study:”

**Motor Fitness Components**

i. Flexibility

ii. Explosive Strength

iii. Balance

iv. Agility

v. Speed

**Anthropometric Characteristics**

i. Leg Length

ii. Upper Leg Length

iii. Lower Leg Length

iv. Arm Length

v. Upper Arm Length
vi. Lower Arm Length  

vii. Hip Width  

viii. Shoulder Width  

ix. Chest Width  

x. Calf Girth  

xi. Thigh Girth  

xii. Chest Girth  

**Motor Educability**  

i. Front Roll  

ii. Back Roll  

iii. Jumping Half-Turns  

iv. Jumping full-Turns  

**ADMINISTRATION OF TEST**  

(FLEXIBILITY)  

**Sit and Reach Test**  

- **Objective:** To determine the subjects lower back and hamstring flexibility  
- **Equipment:** A testing box and flex measure and yard stick  
- **Method:** The subjects asked to remove shoes and placed his feet against the testing box while sitting on the floor with straight knee. The subjects palm facing downward and fingers of both hands together at same length. The subjects asked to lean forward along with measuring line as far as possible without any vigorous movement and to hold the farthest position at least one second.  
- **Scoring:** Each subject given three trails and best one consider the score of subject
Figure-2: Subject’s Performing Sit and Reach Test
Vertical Jump Test

- **Purpose:** To evaluate the explosive strength.
- **Equipment Required:** Marked wall.
- **Method:** The subject stands side on to a wall and reaches up with the hand nearest to the wall. Keeping the feet level on the ground, the point of the fingertips is checked or recorded. This is known as the standing reach height. The competitor then stands far from the wall, and jumps vertically as high as could be expected under the circumstances utilizing both arms and legs to aid in anticipating the body upwards. Endeavour to touch the wall at the most elevated point of the jump.
- **Scoring:** The difference in standing reach height and the jump height is the score. The best of three attempts is recorded.

![Figure-3: Subject’s Performing Vertical Jump Test](image-url)
Stork Balance Stand Test

- **Purpose:** To evaluate the static balance
- **Equipment Required:** Stopwatch, Paper and Pen
- **Procedure:** The subject ought to place both hands on side of waist, then he remain on the foot of the dominate leg the ball of other foot on within supporting knee. After this subject raising his heel from the floor on sign 'start, and to place rehearse the balance. The stopwatch is begun as the heel is raised from the floor. The stopwatch is ceased if any of the take after happens:
  - the hand(s) fall off the hips
  - the supporting foot swivels or moves (jumps) in any heading
  - the non-supporting foot loses contact with the knee.
  - the heel of the supporting foot touches the floor.

**Scoring:** Total time taken by the subject recorded in seconds.

![Figure-4: Subject’s Performing Stork Balance Stand Test](image)
(AGILITY)

Illinois Agility Test

- **Purpose:** To evaluate the running agility.
- **Equipment Required:** Stopwatch, Paper and Pencil, Cones, Measuring Tape.
- **Procedure:** Two parallel lines draw on the floor 10 yards separated and the width (distance between begin and completion point) is 5 meters. Four cones are utilized to mark the start, the two turning points. Another four cones are set down the inside an equivalent distance. Every cone in the centre is dispersed 3.3 meters distance. Subjects ought to lie on their front (head to the begin line) and hands by their shoulders. On the "Go" call the stopwatch is begun, and the competitor gets up as fast as could be expected under the circumstances and around the course in the direction demonstrated, without thumping the cones over, to the completion line, at which the timing is ceased.
- **Scoring:** two trails are given to the subject and the time of better of the two trails is considered to nearest 10<sup>th</sup> of second.
Figure-5: Subject’s Performing Illinois Agility Test
Research Design and Methodology

(SPEED)

50 Yard Dash Test

- **Purpose**: To measure the maximum speed of subjects in a straight path.

- **Equipment Required**: Two parallel lines, 50 yards run were drawn on the standard track. A stopwatch with calibration of \(1/10^{th}\) of a second and a clapper were used for administering the test.

- **Procedure**: The subjects were asked to stand behind the starting line and were also instructed to start with standing start. The subject was asked to start on hearing ‘clapper sound’ and so cover the fifty yards with maximum effort. The time elapsed from the ‘clap’ to the runner crossing the finish line was taken as the test score. The fractions were rounded to the next largest one tenth of a second.

- **Scoring**: Two trials were conducted. The better of the two trials were recorded to the longest of the \(1/10^{th}\) of a second.
Figure-6: Subject’s performing 50 Meter Dash Test
Research Design and Methodology

(LEG LENGTH)

- **Purpose**: To evaluate the leg length.
- **Equipment**: Flexible steel tape.
- **Method**: Leg length was measured vertically from the bottom outside edge of the foot in the center of the instep to a line drawn horizontally through the mid gluteus bulge at the point tendency to a vertical line contracting the buttocks. The tape was placed at the center of the instep and measured to tip of iliac. Leg length was recorded correct to the nearest half centimeters.

![Figure-7: Research Scholar taking the measurement of Leg Length](image)
s(UPPER LEG LENGTH)

- **Purpose**: To find the upper leg length.
- **Equipment**: Flexible steel tape
- **Method**: Subject stands erect in standing position. The upper leg length was measured with the help of flexible steel tape from the distance from the iliopinale to tibiae. The upper leg length was recorded correct to the nearest half a centimeter.

![Research Scholar taking the measurement of Upper Leg Length](image-url)

**Figure-8: Research Scholar taking the measurement of Upper Leg Length**
(LOWER LEG LENGTH)

- **Purpose**: To measure the lower leg length of the subjects.
- **Equipment**: Flexible steel tape.
- **Method**: Subject stand erect with his feet placed 6 to 8 inches apart and the body weight equally divided on both the feet using anthropometer, assess the distance from tibiae to the ground. The lower leg length was recorded correct to the nearest half a centimeter.

![Figure-9: Research Scholar taking the measurement of Lower Leg Length](image-url)
(ARM LENGTH)

- **Purpose**: To assess the arm length.
- **Equipment**: Flexible steel tape.
- **Method**: Arm length was taken from the acromion process to the tip of the middle finger. The arm length was measured with a flexible steel tape. It is recorded to the nearest half a centimeter.

- Figure-10: Research Scholar taking the measurement of Arm Length
(UPPER ARM LENGTH)

- **Purpose**: To find the upper arm length of the subjects.
- **Equipment**: Flexible steel tape.
- **Method**: The subject stood erect by keeping his arms along with his body. Upper arm length was measured with the flexible steel tape. The tip of the tape was placed at the upper edge of the head of acromiale to the tip of the point of radiale. The upper arm length was recorded correct to the nearest half of a centimeter.

![Figure-11: Research Scholar taking the measurement of Upper Arm Length](image-url)
(LOWER ARM LENGTH)

- **Objective:** To evaluate the lower arm length.
- **Equipment:** Flexible steel tape.
- **Method:** The subjects were instructed to stand erect and relaxed. Fore arm length was measured with the flexible steel tape. The tip of the tape was placed at the upper edge of the head of the radius to the tip of the middle finger. The fore arm length was recorded correct to the nearest half a centimeter.

- **Figure-12: Research Scholar taking the measurement of Lower Arm Length**
(HIP WIDTH)

- **Purpose**: To verify the hip width.
- **Equipment**: Sliding calipers.
- **Procedure**: The subject was asked to stand erect with heels together and arms about six inches away from the body. The tester standing behind the subject, applies the inner sides of the sliding calipers to the left and right trochanterion points on the two femur and presses the two cross bars hard so to minimize the soft tissue width. Hip width was recorded correct to the nearest half centimeter.

![Figure-13: Research Scholar taking the measurement of Hip Width](image-url)
(SHOULDER WIDTH)

- **Purpose**: To measure the shoulder width
- **Apparatus**: Sliding calipers, skin marking pencil.
- **Procedure**: The subject was asked to stand erect with shoulder dropping a little forward. The investigator marks the acromiale points with a skin marking pencil. While standing at a back of the subject, the tips of the two cross-bars of the sliding calipers are made to touch the acromiale points on both the shoulders along with the tips of fore fingers of the investigator so as to ensure firm grip of compass on the outer border of the acromian process with a mild pressure. Shoulder width was recorded correct to the nearest half centimeter.

![Figure-14: Research Scholar taking the measurement of Shoulder Width](image-url)
(CHEST WIDTH)

- **Purpose:** To measure the chest width of the subjects.
- **Tool Needed:** Sliding calipers.
- **Procedure:** The subject was asked to stand erect with heels together and arms about six inches away from the body. The investigator stands in front of the subject and applies the tips of the two cross-bar to the lateral most points (Iliocristale) of the Iliac crests pressing hard the over lying subcutaneous fat. Chest width was recorded correct to the nearest half centimeter.

![Research Scholar taking the measurement of Chest Width](image-url)
(Calf Girth)

- **Purpose**: To evaluate the calf girth.
- **Instrument**: A flexible steel tape.
- **Procedure**: The flexible steel tape was wrapped horizontally around the marked lower leg of the subject at the maximal bulge of the calf muscle with slight up and down movements of the steel tape keeping it in a horizontal direction. The maximal girth measurement gives the value of calf girth. The measurement was recorded nearest of a centimeter.

![Figure-16: Research Scholar taking the measurement of Calf Girth](image)
(THIGH GIRTH)

- **Purpose**: To calculate the thigh girth.
- **Tool**: Flexible steel tape and skin marking pencil
- **Procedure**: The subject wearing only under wear was asked to stand at ease with equal weight on both the feet. The middle of the thigh was marked by a horizontal line dividing the distance between the trochanterion and the lateral and lower most point on the lateral condyle of femur, in two equal parts. The steel tape was wrapped around the thigh at the level of the horizontal line and the girth was measured by keeping the steel tape in a horizontal direction and touching gently thigh surface all around. The measurement was recorded nearest of a centimeter.

![Figure-17: Research Scholar taking the measurement of Thigh Girth](image-url)
(CHEST GIRTH)

- **Purpose:** To find the chest girth.
- **Equipment:** Flexible steel tape and skin marking pencil.
- **Procedure:** The subject was asked to take off the clothes from his upper body. A steel tape was wrapped round his chest in such a way that it touches the body all around lightly. The tape should lie over the nipples in front and should pass just below the inferior borders of the scapulae at the back. To note the normal chest girth, the subject was asked to breath normal and the measurement is taken at the end of the normal expiration. Then the subject were instructed to inhale as deep as possible and a maximum value was achieved from the expanded chest at the end of the best effort inspiration after a good deal of motivation. The measurement was recorded nearest of a centimeter.

Figure-18: Research Scholar taking the measurement of Chest Girth
METHENY-JOHNSON MOTOR EDUCABILITY TEST

“Each participant was subjected to preliminary exercise testing to familiarize them with the exercise model. There are four motor productive origin parts are Front roll, Back roll, jumping half-turns and jumping full-turns. Subjects performed a warm up lasting 5-min. and motor adaptation.”

Test Area: In the below figure A canvas measuring 15 feet in length and 2 feet breath. The 15 feet length is divided into ten section of each 18’’ inch each. The width of the transverse lines is ¾ inch and 3 inch alternatively as show in figure. So that centre of lines remains 18’’ inch apart. Another ¾ inch wide line is marked lengthwise in the middle of the canvas length. This properly marked piece of canvas is placed over a gymnasium mat with the sides and ends properly tucked to the mat so that the canvas remains properly stretched. Alternatively, the above area may be directly painted or marked on the gymnasium mat without using the canvas.

Test item:

i. Front Roll: The subject is to perform the rolls without touching limits or reaching zone by the rules. Rules are ignoring the long middle dividing line. Subject is started outside the marked area and performed two front roll, one up to half of 15’ length i.e 7.5’inch and then another 7.5’.

Scoring: The maximum points are 10 for each 5 points for front roll. Deducted for 2 points for overreaching side line, right or left each roll; deducted one point while reaching the end limit on each roll and if the subject fails to performed a true rolls the full five points will be deducted.
Figure-19: Subject’s Performing Front Roll.

ii. Back Roll: The test is similar to front roll with the respect to performing and scoring. The subject is to start outside the marked chart area and is to perform two back rolls in the 2 feet lane area, one up to first half and the second back roll in the second half.

- **Scoring:** The subject performed two rolls for each proper roll subject given the five points, hence limits of 10 points. Two points are subtract while subject crossing side line, right or left and one point also deducted for overreaching on each roll. If he fails to complete the exact back roll, five points will be minus.
Figure-20: Subject’s Performing Back Roll.

iii. Jumping Half-Turns: The subject start with feet on first feet on first 3inch line, jump with both feet to second 3inch wide line, moving a half turn either right or left, jump third 3inch line and moving half turn in opposite direction to first half-turn and then to 4th and 5th 3inch wide lines half turns right and left.

- **Scoring:** Ten points are given to the perfect implementation of four jumps. The deduction of 2points based on each wrong jump, when the subject turn the wrong way by un proper landing with both feet.
Figure-21: Subject’s Performing Jumping Half-Turns.

v. **Jumping Full-Turns:** The subject, from the center of lane starts with feet outside the marked area. Subjects has to be jump together to second rectangular space by moving right or left, he will keep on jumping to rectangular space by taking full turns and rotating the body in same direction and landing on both feet every time.

**Scoring:** For the five accurate jumps subject cover 10 points. If subject fails to maintain the balance on both feet and oversteps the square, two points are deducted on the basis of wrong movement.
Figure-22: Subject’s Performing Jumping Full-Turns
DESIGN OF THE STUDY

This is an exploratory study that has employed method of data collection and analysis quantitatively. The main cause of the study was to observe the difference of Motor Fitness Components, Anthropometric Characteristics and Motor Educability among Foil, Sabre and Epee fencers.
STATISTICAL TECHNIQUES EMPLOYED

“For the statistical evaluation SPSS version 14.0 used for all analysis. The 5% critical level (p<0.05) was considered to indicate statistical significance. The differences in the mean of each group for selected variable were tested for the significance of difference by One-way Analysis of Variance (ANOVA). For further analysis Post-Hoc Test (Scheffe’s Test) was applied.”