PROCEDURE

In this chapter selection of the subjects, reliability of data, instrumental reliability, tester's competency, subjects reliability, criterion (composite scores), collection of data, administration of tests, identification of specific physical fitness test, procedure for analysis of data, identification of test battery and statistical techniques for norms have been explained.

SELECTION OF SUBJECTS

The subjects of this study were three hundred wrestlers who participated in the inter-college wrestling competitions of their respective universities. The subjects were drawn from the colleges affiliated to three universities of Haryana State, namely Kurukeshtra University, Kurukeshtra; Maharishi Dayanand University, Rohtak and Haryana Agriculture University, Hissar.

SELECTION OF SPECIFIC PHYSICAL FITNESS TEST

In order to select a specific physical fitness test, first of all, a list of selected test items was
finalised, keeping in mind the relevancy for measuring the physical fitness of wrestlers. A systematized list of eighteen physical fitness items was chalked out by the researcher with the help of wrestling coaches and experts in physical education. The specific physical fitness components such as Muscular Strength, Speed Endurance, Flexibility, Agility were kept in mind to prepare the valid instructions for the test items. The pilot study was conducted on all (eighteen) selected test items which are given in Table 1.
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Fitness Component</th>
<th>S.No.</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Muscular Strength</td>
<td>1.</td>
<td>Pull Ups</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.</td>
<td>Modified Dips</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.</td>
<td>Medicine Ball throw</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.</td>
<td>Standing Broad Jump</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.</td>
<td>Sit Ups</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.</td>
<td>Half Squats with equal weight</td>
</tr>
<tr>
<td>2.</td>
<td>Speed</td>
<td>1.</td>
<td>30 Metres Run</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.</td>
<td>50 Metres Run</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.</td>
<td>Speed of Movement</td>
</tr>
<tr>
<td>3.</td>
<td>Endurance</td>
<td>1.</td>
<td>1000 metres Run</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.</td>
<td>3 Minutes Run</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.</td>
<td>6 Minutes Run</td>
</tr>
<tr>
<td>4.</td>
<td>Flexibility</td>
<td>1.</td>
<td>Bridge Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.</td>
<td>Modified Sit and Reach Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.</td>
<td>Extent Flexibility</td>
</tr>
<tr>
<td>5.</td>
<td>Agility</td>
<td>1.</td>
<td>Shuttle Run</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.</td>
<td>Side Step Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.</td>
<td>Burpee Test</td>
</tr>
</tbody>
</table>
RELIABILITY OF DATA

Reliability of the data depends upon the instrument, tester competency, subject reliability and reliability of the test and hence the reliability of these items was established scientifically.

INSTRUMENT RELIABILITY

The Stop Watches, Measuring Tapes, Medicine Balls, Flexo meter case etc. used in this study were calibrated and supplied by the leading firms and their reliability was ensured by the manufacturers. The material used was of fine quality. The Stop watches measuring 1/10 of second were used. Thus the instruments were considered reliable for the purpose of this study.

TESTER'S COMPETENCY

The researcher himself being a University and State level wrestler and N.I.S. qualified coach in wrestling is quite well acquainted with the techniques for conducting tests. However, he had a number of practice sessions in the testing procedure under the guidance of his supervisor to acquire proficiency in testing. All the measurements were taken by the investigator himself with the assistance of
qualified personnel and wrestling coached, who were trained and acquainted with the tests and testing procedures.

Tester's competency was evaluated by test-retest method and consistency of results was obtained by Product moment Correlation. The data were collected on 30 selected subjects through test-retest. The test-retest scores for all test items were then correlated and coefficient thus obtained has been presented in Table. 2
### TABLE 2

**RELIABILITY COEFFICIENTS OF TEST-RETEST SCORES**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Test</th>
<th>Coefficient of correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pull-Ups</td>
<td>.80</td>
</tr>
<tr>
<td>2</td>
<td>Modified Dips</td>
<td>.93</td>
</tr>
<tr>
<td>3</td>
<td>Medicine Ball Throw (Six pound)</td>
<td>.85</td>
</tr>
<tr>
<td>4</td>
<td>Standing Broad Jump</td>
<td>.92</td>
</tr>
<tr>
<td>5</td>
<td>Sit Ups</td>
<td>.85</td>
</tr>
<tr>
<td>6</td>
<td>Half Squat with equal weight</td>
<td>.88</td>
</tr>
<tr>
<td>7</td>
<td>30 Meters Run</td>
<td>.90</td>
</tr>
<tr>
<td>8</td>
<td>50 Meters Run</td>
<td>.82</td>
</tr>
<tr>
<td>9</td>
<td>Speed of Movement</td>
<td>.80</td>
</tr>
<tr>
<td>10</td>
<td>1000 Metres Run</td>
<td>.90</td>
</tr>
<tr>
<td>11</td>
<td>3 Minutes Run</td>
<td>.93</td>
</tr>
<tr>
<td>12</td>
<td>6 Minutes Run</td>
<td>.92</td>
</tr>
<tr>
<td>13</td>
<td>Bridge up Test</td>
<td>.84</td>
</tr>
<tr>
<td>14</td>
<td>Modified Sit and Reach Test</td>
<td>.87</td>
</tr>
<tr>
<td>15</td>
<td>Extent Flexibility</td>
<td>.90</td>
</tr>
<tr>
<td>16</td>
<td>Shuttle Run</td>
<td>.86</td>
</tr>
<tr>
<td>17</td>
<td>Side Step Test</td>
<td>.94</td>
</tr>
<tr>
<td>18</td>
<td>Burpee Test</td>
<td>.84</td>
</tr>
</tbody>
</table>
It may be observed from Table 2 that the data pertaining to different tests were quite reliable and the test further indicated that the tester's reliability was significantly high (reliability coefficient ranging from .80 to .93), which ensured the competency of the tester to administer the test.

**SUBJECT RELIABILITY**

The test-retest coefficient of correlation also established the subject reliability, because the same subjects were used under similar conditions by the same tester and no motivational techniques were used.

**CRITERIAN : COMPOSITE SCORES**

Composite scores of all the test items were considered as the criterian measure. Johnson & Nelson (1982) and Clarke (1976) also suggested that composite scores could be used as a criterian measure to establish the validity of the test items. The raw scores of all the basic test items were converted into standard scores and added up to serve as composite scores.
COLLECTION OF DATA

The data of the chosen test items were collected in two phases. In the first phase, to measure the validity the data of 18 test items were collected. In the second phase, data were collected to establish the norms of the finally selected test items for the specific physical fitness test conducted on the selected wrestlers.

COLLECTION OF DATA FOR THE FIRST PHASE OF THE STUDY

The data for the first phase of the study were collected on 100 wrestlers selected from the various colleges affiliated to the Universities of Haryana State, namely Kurukshetra University, Kurukshetra; Maharishi Dayanand University, Rohtak, and Haryana Agriculture University, Hissar. They represented their respective colleges in the Inter-College Wrestling competitions of three Universities of Haryana State. Samples was drawn from those subjects who had participated in Inter college competitions.

The data were collected during the peak season of the wrestlers. This period was considered to be the best period for the collection of data as the wrestlers were brought to have acquired maximum fitness. Before the testing programme was organised, the researcher assembled all the
wrestlers together to brief them on the nature, the modalities and the objectives of the present investigation. The scholar gathered the subjects of each college, at different periods of time, and demonstrated to them various tests so that they could form a mental picture of the various tests they were going to take.

**ADMINISTRATION OF TESTS**

The help of qualified wrestling coaches and teachers of Physical Education was taken by the scholar to administer the tests to the subjects. The investigator took care to explain the tests and the testing procedure to the helpers and the subjects. All the test items were then demonstrated to the wrestlers so that the subjects could form a mental picture of the various tests they were going to take. Stress was put to ensure uniformity, accuracy and standardisation in the administration of the test. The subjects were directed to come in proper playing kit during the performance of the tests. No motivational techniques were used to enhance their performances. But each subject performed on each test enthusiastically with the spirit of competition to surpass his counterparts and know his status of Physical Fitness.
PULL UPS

In the manner described below, each subject performed as many pull ups as he could possibly do from a horizontal bar of such a height that the feet of the tallest wrestler did not touch the floor while performing the test.

In taking the pull up test the wrestler hang from the bar by his hands with forward grip and chinned himself as many times as he could (Figure 3.1) In executing the movement, he pulled himself up until his chin was even with his hands then lowered himself until his arms were straight. He was not permitted to kick, jerk or use the kep motion.

The number of complete pull-ups to the nearest whole number was recorded as a score in shoulder girdle strength.

MODIFIED DIPS

The subject was asked to take dip position and the partner held his both ankles and lifted him to his shoulder level. From this position, on signal 'Start' the subject dipped the whole body thus bringing down the entire body weight on his hand. (Figure 3.2) He then lifted the body weight up and returned to the starting position. This was scored as one. This process was continued to the maximum till the subject got tired completely. Swinging of the body
Fig. 3:1 PULL UP’S
Fig. 3.2 MODIFIED DIPS
or stopping in between was not allowed. Dip was considered complete when the arms were fully extended while taking the body up. Bending of the elbows was not counted as 'Dip scoring'.

The total number of completed dips without any break were recorded as score of the individual.

**MEDICINE BALL THROW (Six Pound)**

The subject was asked to stand as close to the throwing line and to take a comfortable throwing position. After taking throwing position he was instructed to throw the medicine ball as far as he could with both hands, without moving his feet. Run up or shifting feet position were not allowed while executing the throw. Throw was made over the head. (Figure 3.3)

Best of three trials was measured in metre as score for this test.

**STANDING BROAD JUMP**

A take off line was drawn near one edge of a jumping pit. The subject was asked to take his position with toes just behind the take-off line, feet slightly apart. Taking off from both feet simultaneously, he jumped to cover maximum possible horizontal distance, landing on both feet.
Fig. 3.3 SIX POUND MEDICINE BALL THROW TEST
While jumping, he crouched slightly and swung the arms to aid the jump. (Figure 3.4) Three trials were given to him, the best of among these was credited as his score. The jumping pit was filled with fine river sand and frequently levelled with a long wooden block.

The horizontal distance between the take-off line and the nearest break made in landing pit was measured. The distance measured, in metres, was recorded as the score for explosive power of legs.

SIT UPS

Each subject was asked to do as many sit ups as he could perform in a minute in the manner described as under:-

The wrestler assumed a supine position, knee bent at angle less than 90 and hands clapped behind the neck. (Figure 3.5). The wrestler brought his hands forward towards his knees in a curl up motion, and then returned the supine position.

The numbers of completed sit ups to the nearest whole number were recorded as a score for the strength of abdominal muscle.

HALF SQUAT WITH EQUAL WEIGHT

The subject was asked to lift weight on his
Fig. 3·4 STANDING BROAD JUMP
Fig. 3.5  SIT-UP'S TEST
shoulder equal to his body weight and performed half squat presented in (Figure 3.6). This was repeated by the subject, as many times as he could, without any break. Half squats performed by the subject in one duration showed his strength. Scoring was done according to the total number of half squats performed by the subject in one minute.

30 METRES RUN

Two parallel lines 30 metres apart from each other were marked (Figure 3.7). Two subjects were tested at a time. They were asked to take standing start from behind the starting line. The clapper was clapped after the caution "ready" was given to the subjects. The starter stood in such a position, so that the 'v' of the clapper (open before clap) was visible to the time keepers. As the 'v' closed, the clap was executed, the time keepers at the finish line started their stop watches. The subjects sprinted as fast as possible across the finish line and the stop watches were stopped, as and when the concerned subject crossed the finish line.

The elapsed time, from the starting signal until the subject crossed the finish line was recorded to the nearest 1/10 of a second as a score.
Fig. 3.6
HALF SQUAT WITH EQUAL BODY WEIGHT
Fig. 3.7 30-METRES RUN

Start Line

30 Metres

Finish Line
50 METRES RUN

Two parallel line 50 metres apart from each other were marked (Figure 3.8). Two subjects were tested at a time. They were asked to take standing start behind the starting line. The clapper was clapped after the caution "ready" was given to the subjects. The starter stood in such a position, so that the 'v' of the clapper (open before clap) was visible to the time keepers. As the 'v' closed, when the clap was executed, the time keepers at the finish line started their stop watches. The subjects sprinted as fast as possible across the finish line and the stop watches were stopped, as and when the concerned subject covered the distance.

The elapsed time, from the starting signal until the subject crossed the finish line was recorded to the nearest 1/10 of a second as a score.

SPEED OF MOVEMENT TEST

Each subject was asked to sit on a chair with his fingertips touching the edge of a table. Two lines one foot apart were marked on the table in such a way that the palms faced each other on the two lines marked on the table. At the ready position, it was made sure that the subject hands did not move before the falling of a measure scale, marked
Fig. 3.8 50-METRES RUN

Start Line

50 Metres

Finish Line
in centimeters. The tester held the timer scale near its top so that it hung midway between the subject's hands. After the command "ready" was given, the timer was released and the subject attempted to stop it as quickly as possible by bringing the hands together in a clapping motion. (Figure 3.9).

The score of the subject was noted at the point just above the upper edge of the hands after the catch. The tester could thus judge the speed of movement.

1000 METRES RUN

Five to six runners selected at random were started off a clapper with instructions to run the distance of 1000 metres. On 400 metre track around Football/ Hockey fields any other space available in the college. They were instructed not to walk or stop in between the course. Equal number of time keeper at the finish line took the timings as the runners crossed the finish line. The recorder noted down the timings (Figure 3.10).

The time elapsed between the start and finish line was recorded as the score of for the endurance of the subject.
Fig. 3.9  SPEED OF MOVEMENT TEST
Fig. 3.10

1000 METRES RUN

START LINE

200m

400m

FINISH LINE
THREE MINUTES RUN

Five to six runners selected at random were instructed to run simultaneously at the same time continuously for three minutes on a 400 metres track/Hockey/Football field. They were asked not to walk or stop in between. Each runner was assigned an observer to measure the distance of the subject (Figure 3.11).

Scoring was done according to the distance covered by the runners in metres in limited time duration of 3 minutes.

SIX MINUTES RUN

Five to six runners selected at random were instructed to run simultaneously at the same time continuously for three minutes on a 400 metres track/Hockey/Football field. They were asked not to walk or stop in between. Each runner was assigned an observer to measure the distance of the subject (Figure 3.12).

Scoring was done according to the distance covered by the runners in metres in limited time duration of 6 minutes.
Fig. 3.11

THREE MINUTES RUN

START LINE

200m

400m
BRIDGE-UP TEST

The subject assumed supine position on the floor and he raised his body to make an arch. While making an arch the hands and feet were brought as close to each other as possible. (Figure 3.13)

The tester, who took up his position at one side of the subject, placed zero end of the yard stick on the floor and slid the flexomeasure case vertically upward until the ruler guide touched the highest point of the subject's arched spine. The reading (to the nearest quarter of an inch) was recorded in the case of window at the lower (C-D) line.

The best score (to the nearest quarter of an inch) of the three trials was recorded.

MODIFIED SIT AND REACH TEST

A yard stick was taken and its 15 inch mark was aligned with a line drawn on the floor. The yard stick was taped to the floor.

The subject was instructed to sit down and to align his heels with the nearer edge of the 15 inch mark. He was asked to slide back his seat beyond the zero mark of the yard stick. (Figure 3.14) One assistant stood and braced his
Fig. 3.13 BRIDGE-UP-TEST
Fig. 3.14 MODIFIED SIT-AND-REACH TEST

1. SUBJECT

2. SUBJECT

TESTER
toes against the heels of the subject. As the subject got ready to stretch, two assistants held the knees of the subject in a locked position on either side of him. The subject was asked to slowly stretch forward with heels not more than 5 inches apart and to touch the yard stick with the fingertips of hands as much down as possible.

The best of three trials measured to the nearest quarter of an inch was taken as the test score of the subject.

EXTENT FLEXIBILITY

A measuring scale, 75 centimeter long, was drawn on a wall and was marked off in one centimeter intervals from 0-75 centimeters. The scale was wide enough to suit the subjects of different heights. Another line, perpendicular to the wall and in line with 30 centimeters marked on the scale was drawn on the floor as given in (Figure 3.15)

The subject to be tested was asked to stand with his left side towards the wall, his toes touching this line, feet together and perpendicular to the line marked on the door. The subject stood at an arms length from the wall so that he could just touch the wall, with his left fist when his arm was held horizontal from the shoulder.

The subject was then asked to extend his right arm straight at shoulder height, keeping his both feet together.
Fig. 3.15  
EXTENT FLEXIBILITY TEST
and at the line. He was asked to keep his palm down, fingers together and extended. He was then asked to twist clockwise (around his back) as far as possible so that he could touch the scale marked on the wall with his right hand. During this movement, the tester helped the subject to keep his feet in place by supporting his feet so that these are not shifted.

Each student was given one trial to get a feel of the test. If he committed any errors these were corrected by the tester. His second try was counted and recorded as his score.

The farthest point reached (in centimeters) on the scale and held for at least two seconds was the score of the subject.

SHUTTLE RUN

Two parallel lines were marked on the ground, ten meters apart. For this test item, starting and finishing lines were the same. Two wooden blocks were placed in each lane behind the restraining line. (Figure 3.16) Two subjects, selected at random, positioned themselves behind the starting line. On the command 'go' they ran to the opposite end line picked up a block, ran back to the starting line, placed the block behind it, ran back again and picked up the second block and carried it across the
Fig. 3.16  SHUTTLE RUN
starting line. The time of each run between the starting and crossing the same on second return was taken by two timers. Two trials were allowed with an interval during each run. Another pair of subjects was tested.

Better timing of two trials recorded to the nearest one tenth of the second was the score of the subject.

SIDE STEP TEST

Three five feet long parallel lines on the ground with a distance of four feet each were drawn. (Figure 3.17) The student assumed a starting position astride the center line with his feet parallel to the line. At the signal 'Go' the student side steps to his left so that his left foot touches the ground beyond the four feet line. This was counted as 'one' then he step to his right side and repeats it alternatively. In it student was not allowed to cross his feet at any time and turn his shoulder or hips. He continued side steps in this manner as fast as possible for ten seconds without any break.

The scoring was done in terms of the number of parts executed in 10 seconds.
Fig. 3-17  SIDE STEP TEST
BURPEE TEST

The subject adopted a standing position, to start the exercise the command was given 'Ready' and 'Go' and for discontinuing the exercise the command was "stop". The exercise was performed for a duration of 30 seconds for as many times as possible by adopting a correct position as given in (Figure 3.18). The exercise was performed in parts from the standing position '1' bent at the knee and waist and placed the hand on the ground in front of the feet. '2' thrust the legs backward to a front leaning rest position, '3' return to the squat position, and '4' stand erect. This whole process is count one. The exercise was repeated as many times as possible for a duration of 30 seconds. The tester recorded the time and the assistant counted the number of exercises performed by the subject.

The number of correct exercises executed during the 30 seconds was the score of the subject.
Fig. 3.18  BURPEE TEST

1. Stand up.
2. Bend down and touch the ground.
3. Push up from the ground.
4. Jump up and return to the starting position.
THE SECOND PHASE OF STUDY AND THE COLLECTION OF DATA

In the second phase of the study, a fresh data on 200 wrestlers were collected. During the administration of newly developed specific physical fitness test, six variables (Table 3) for the collection of data were identified and the same procedure was followed as mentioned in the first phase of this Chapter.

<table>
<thead>
<tr>
<th>TEST COMPONENT</th>
<th>TEST COMPONENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent Flexibility</td>
<td>Flexibility</td>
</tr>
<tr>
<td>Standing Broad Jump</td>
<td>Leg power</td>
</tr>
<tr>
<td>30 Metres Run</td>
<td>Speed</td>
</tr>
<tr>
<td>Side Step Test</td>
<td>Agility</td>
</tr>
<tr>
<td>Modified Dips</td>
<td>Arm endurance</td>
</tr>
<tr>
<td>6 Minutes Run</td>
<td>Endurance</td>
</tr>
</tbody>
</table>

Under the uniformity survey of physical fitness test for wrestlers data were taken from different colleges of three universities of Haryana, that is Kurukeshtra University, Kurukeshtra; Maharishi Dayanand University, Rohtak and Haryana Agriculture University, Hissar.
STATISTICAL PROCEDURE

The main purpose of this investigation was to construct the specific physical fitness test for the wrestler of the college level.

Factor analysis technique was used as an instrument to select the test items out of eighteen variables, best suited to measure the specific physical fitness of the wrestlers.

The correlation matrix of the inter correlation between the 18 variables was obtained by applying Pearson's product Movement Method. Utilizing the principal axis form of preliminary rotation, as suggested by H.H. Harman (1960) to obtain unrotated and rotated condition matrix was selected for inter-representation, as recommended by Comrey (1975). For rotated factor the Kaiser's Varimax criterion (1958) was used. Analysis of variance (ANOVA) was applied to three weight categories (weight category I 48 kg to 57 kg, weight category II 62 kg to 74 kg III and weight category of III 82 kg to 100 kg) on each test items to ascertain the mean difference between the score of each weight category. Hull Scale and T Scale were use for the development of norms. All statistical analysis were got done on an VAX-8350 Computer System of Department of Computer Science and Application, Panjab University, Chandigarh.