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# RELATIONSHIP OF SELECTED MOTOR FITNESS COMPONENTS, ANTHROPOMETRIC MEASUREMENTS AND PHYSIOLOGICAL VARIABLES WITH 100MT SPRINT PERFORMANCE OF SPRINTERS

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ABSTRACT :

*The purpose of the study was to see the relationship of selected motor fitness components, anthropometric measurements and physiological variables with 100mt sprint performance of sprinters. Twenty male athletes aged between 14-18 years were selected from sports authority of India (SAI) Lucknow. The Motor Fitness Components included Speed (50 yard run), Muscular strength (Pull-ups), Muscular endurance (Bent knee sit-ups), Muscular power (Standing broad jump), Circulatory respiratory endurance (600-yards run/walk test), Flexibility (Sit and Reach) and Agility (Shuttle run). Anthropometric Measurements included are Standing height, Weight, Leg length, Upper leg length, Lower leg length, Arm length, Upper arm length, Lower arm length, Hip width, Shoulder width, Chest width, Calf girth, Thigh girth, Chest girth, Upper arm girth and Lower arm girth. Physiological Variables are Resting pulse rate, Positive breath holding time, Negative breadth holding time, Body composition, Systolic blood pressure, Diastolic blood pressure, Respiratory rate and Maximum expiratory pressure. The performance ability of sprinters in motor fitness components namely speed (50 yard run), Muscular endurance (Bent knee sit-ups), muscular power (standing broad jump), circulatory respiratory endurance (600-yard run/walk) and agility (shuttle run) are significant related to 100mt sprint performance. Anthropometric measurements namely Standing height, Weight, Upper leg length, hip width, shoulder width and chest girth are significant related to 100mt sprint performance. Physiological variables namely positive breadth holding time are significant related to 100mt sprint performance. To find out the motor fitness components, anthropometric measurements and physiological variables to 100mt sprint performance correlations, Pearson product moment correlation, multiple correlations, and regression analysis statistical technique were employed.*

KEYWORDS : *Motor fitness components, Anthropometric measurements, Physiological variables and Sprinters.*

## INTRODUCTION:

Sports and games are competitive in nature and meant for a particular age group. The talented and gifted youngsters only enjoy the participation. So the process of channelization of athletes into various sports and games should be according to their ability and interest. After various investigation made by the sports experts, this is an important phenomenon in the present competitive sports world. The ignorance of the person may build a great stumbling block in the progress of sports in the country because it has been seen that a large population in India remains aloof from competitive sports.

The role of biomechanics in attaining high performance cannot be over looked, since it is only scientific field, which helps to identify the faults in performing techniques very precisely. There are basically two methods which motion can analyze skills, the qualitative method and the quantitative method. The best method to evaluate technique is called cinematography. This is quantitative method which is very accurate but at the same time costly and time consuming. This method cannot be applied by all coaches working in the field for the betterment of performance due to its cost involvement. The other method, which is yet to be fully explored, is qualitative analysis, this method involves comparatively very low cost and is equally valid in identifying the sequence of movements and faults.

## METHODOLOGY:-

Twenty male athletes aged between 14-18 years were selected for this study. These subjects were selected from the Sports Authority of India (SAI) Lucknow. The following Motor Fitness Components included Speed (50 yard run), Muscular strength (Pull-ups), Muscular endurance (Bent knee sit-ups), Muscular power (Standing broad jump), Circulatory respiratory endurance (600-yards run/walk test), Flexibility (Sit and Reach) and Agility (Shuttle run). Anthropometric Measurements included are Standing height, Weight, Leg length, Upper leg length, Lower leg length, Arm length, Upper arm length, Lower arm length, Hip width, Shoulder width, Chest width, Calf girth, Thigh girth, Chest girth, Upper arm girth and Lower arm girth Physiological Variables are Resting pulse rate, Positive breath holding time, Negative breadth holding time, Body composition, Systolic blood pressure, Diastolic blood pressure, Respiratory rate and Maximum expiratory pressure. The necessary data was collected by administering various tests for the chosen variables. The time chosen for assessing the performance ability was administered in the Athletic ground of Sports Authority of India (SAI) and also the Motor fitness components, Anthropometric measurements and Physiological variables. Statistical analysis of data collected on twenty male athletes i.e 100mt sprint. The data on 100mt sprint performance (dependent variables) along with motor fitness components, anthropometric measurements and physiological variables (independent variables) were examined by Pearson's product moment correlation, Multiple correlation, Regression analysis statistical technique was employed.

## FINDINGS:-

TABLE-1
RELATIONSHIP OF MOTOR FITNESS COMPONENTS WITH
100MT SPRINT PERFORMANCE OF SPRINTERS

| Variables | Coefficient of correlation 'r' |
|---|---|
| Speed (50 yard run) | 0.682* |
| Muscular strength (pull-ups) | - 0.389 |
| Muscular endurance (Bent knee sit-ups) | - 0.661* |
| Muscular power (Standing broad jump) | - 0.684* |
| Circulatory respiratory endurance (600-yard run/walk) | 0.723* |
| Flexibility (sit and reach) | 0.043 |
| Agility (shuttle run) | 0.711* |

From the Table-1 it is clear that five motor fitness components have significant relationship with 100mt sprint performance of sprinters. They are 50 yard run (0.682), bent knee sit-ups (-0.661), standing broad jump (-0.684), 600 yard run/walk (0.723) and shuttle run (0.711). In respect to other motor fitness components (pull-ups and sit and reach) the relationship with 100mt sprint performance is not found to be statistically significant at 0.05 level as they are below tabulated value i.e 0.444.

## TABLE-2
## RELATIONSHIP OF ANTHROPOMETRIC MEASUREMENTS WITH 100MT SPRINT PERFORMANCE OF SPRINTERS

| Variables | Coefficient of correlation 'r' |
|---|---|
| Standing height | 0.517* |
| Weight | 0.467* |
| Leg length | 0.434 |
| Upper leg length | 0.454* |
| Lower leg length | 0.395 |
| Arm length | 0.335 |
| Upper arm length | 0.267 |
| Lower arm length | 0.297 |
| Hip width | 0.639* |
| Shoulder width | 0.595* |
| Chest width | 0.723* |
| Calf girth | 0.270 |
| Thigh girth | 0.116 |
| Chest girth | 0.275 |
| Upper arm girth | - 0.049 |
| Lower arm girth | - 0.018 |

From Table-2 it is clear that six anthropometric measurements have significant relationship with 100mt sprint performance of sprinters. They are standing height (0.517), weight (0.472), upper leg length (0.454), hip width (0.639), shoulder width (0.595) and chest width (0.723). In respect to other anthropometric measurements (leg length, lower leg length, arm length, upper arm length, lower arm length, calf girth, thigh girth, chest girth, upper arm girth and lower arm girth) the relationship with 100mt sprint performance is not found to be statistically significant at 0.05 level as they are below tabulated value i.e 0.444.

## TABLE-3
## RELATIONSHIP OF PHYSIOLOGICAL VARIABLES WITH 100MT SPRINT PERFORMANCE OF SPRINTERS

| Variables | Coefficient of correlation 'r' |
|---|---|
| Resting pulse rate | 0.165 |
| Positive breath holding time | - 0.501* |
| Negative breath holding time | - 0.002 |
| Body composition | - 0.132 |
| Systolic blood pressure | - 0.116 |
| Diastolic blood pressure | - 0.234 |
| Respiratory rate | - 0.373 |
| Maximum expiratory pressure | - 0.285 |

From Table-3 it is clear that one physiological variable have significant relationship with 100mt sprint performance of sprinters. They are positive breadth holding time (- 0.501). In respect to other physiological variables (Resting pulse rate, negative breadth holding time, body composition, systolic blood pressure, diastolic blood pressure, respiratory rate and maximum expiratory pressure) the relationship with 100mt sprint performance is not found to be statistically significant at 0.05 level as they are below tabulated value i.e 0.444.

## TABLE-4
## COMBINED CONTRIBUTION OF MOTOR FITNESS COMPONENTS, ANTHROPOMETRIC MEASUREMENTS AND PHYSIOLOGICAL VARIABLES WITH 100MT SPRINT PERFORMANCE OF SPRINTERS

| Criterion variables | Independent variables | Multiple correlation | Coefficient of multiple correlation |
|---|---|---|---|
| 100mt Sprint | 50 yard run (1) | Rc.1345789(11)(16)(17)(18)(25) | 0.960* |
| | Bent knee sit-ups (3) | | |
| | Standing broad jump (4) | | |
| | 600 yard run/walk (5) | | |
| | Shuttle run (7) | | |
| | Standing height (8) | | |
| | Weight (9) | | |
| | Upper leg length (11) | | |
| | Hip width (16) | | |
| | Shoulder width (17) | | |
| | Chest width (18) | | |
| | Positive breadth holding time (25) | | |

Table-4 has disclosed that the combined contribution of motor fitness components, anthropometric measurements and physiological variables of 100mt sprint performance are 50 yard run (1), bent knee sit-ups (3), standing broad jump (4), 600 yard run/walk (5), shuttle run (7), standing height (8), weight (9), upper leg length (11), hip width (16), shoulder width (17), chest width (18) and positive breadth holding time (25) is significant at 0.05 level of confidence as the computed value of 0.960* Rc. 1345789(11)(16)(17)(18)(25) for multiple correlation was more than the value of 0.444 required for the multiple correlation coefficient to be significant at 0.05 level of significant with 18 degree of freedom. From the obtained value of multiple correlations it can be deduced that all the above variables taken together contributes to 100mt sprint performance of sprinters.

## TABLE-5
## LINEAR REGRESSION EQUATIONS OF MOTOR FITNESS COMPONENTS, ANTHROPOMETRIC MEASUREMENTS AND PHYSIOLOGICAL VARIABLES WITH 100MT SPRINT PERFORMANCE OF SPRINTERS

| S.No | Linear regression equations |
|---|---|
| 1. | Y = 4.80 + 1.10 (50 yards run) |
| 2. | Y = 13.43 – 0.03 (bent knee sit-ups) |
| 3. | Y = 16.69 – 1.92 (standing broad jump) |
| 4. | Y = 13.43 – 0.03 (600 yard run/walk) |
| 5. | Y = 9.16 + 0.23 (shuttle run) |
| 6. | Y = 6.08 + 0.03 (standing height) |
| 7. | Y = 9.12 + 0.03 (weight) |
| 8. | Y = 7.04 + 0.09 (upper leg length) |
| 9. | Y = 8.22 + 0.11 (hip width) |
| 10. | Y = 4.17 + 0.20 (shoulder width) |
| 11. | Y = 6.87 + 0.15 (chest width) |
| 12. | Y = 13.27 + 0.03 (positive breadth holding time) |

Where Y = Criterion variables i.e 100mt sprint performance

Multiple linear regression analysis in order to predict 100mt sprint performance Y = 4.283 (constant) + 0.932 (50 yard run) – 0.006 (bent knee sit-ups) + 0.180 (standing broad jump) + 0.004 (600-yard run/walk) + 0.016 (shuttle run) + 0.052 (standing height) – 0.015 (weight) – 0.068 (upper leg length) – 0.019 (hip width) – 0.092 (shoulder width) + 0.131 (chest width) – 0.012 (positive breadth holding time).

## DISCUSSION OF FINDINGS:-

Hundred meters run is a sprinting speed event and is greatly influenced by the frequency and length of the stride. Since the frequency of stride gets stabilized at a very young age, therefore, in this event in order to improve performance a great stress is laid on increasing the length of the stride and frequency. A sprinter basically needs a very high amount of speed which he develops by the genetic make-up and also the training efficiency. The length of the stride depends upon the person's ability to lengthen his ariel phase which is made possible by pulling the leg higher. This is made possible mainly by the contraction of quadriceps groups of muscles with the abdominal muscles. Shuttle run enables a person to execute quick body movements so that the faster movement of the legs can be properly synchronized with the movements of the arms. The role played by frequency of strides is largely affected by the speed of movement of the body. An athlete with good height can run fast by opening the stride length by spending considerably less energy. A taller athlete may psychologically affect the opponents performance. Weight will be helpful in increasing the force applied to pull the body forward with a fast speed from the block. The longer leg increases leverage action as well as longer strides length which help to lead further. The leg and hip equally important are reactive on the areas, which work alternatively to the legs. The arm actions should also be correspondence to the leg actions as any difference in the power and range of leg and arm movements will lead to instability and disproportionate actions. The high intensity of exercise has very high level of energy requirements and so such demands for oxygen consumption but the poor supply of oxygen might be starving the working muscles for oxygen.

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