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Comparison In Characteristics Of Body Composition And Cardiovascular Parameters Amongst Jumpers, Sprinters, And Long-Distance Runners

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Abstract
The purpose of this study was to measure and compare physiological variables such as vital capacity (VC), heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), body fat percentage (BF), lean body mass (LBM), and body density (BD) among jumpers, sprinters, and long-distance runners. Following informed permission, a total of 30 participants (10 from each group) were recruited. Data were gathered using proper equipment. Mean, standard error, and ANVOA were used to analyze the data. The study found no significant change in VC, HR, SBP, or DBP across the groups ($p<0.05$). In contrast, there were significant differences in BF ($p>0.05$), LBM ($p>0.05$), and BD ($p>0.05$) between power athletes and long-distance runners. In conclusion, the body fat percentage of all analyzed groups is less than fifteen percent. Sprinters and jumpers have more body fat and lean mass compared to long-distance runners. Runners were shown to have a greater body density than jumpers or sprinters.

Keywords: Body Composition, Cardiovascular Parameters, Jumpers, Sprinters, and Long-Distance Runners.

Introduction:

Track and field comprise a diverse array of activities, each with distinct physical demands. Athletes engaged in power events (e.g., sprints, hurdles, jumps) train at maximum or near-maximal effort in brief intervals. In contrast, athletes engaged in endurance sports (e.g., middle-distance and distance running) train at reduced intensity levels for prolonged durations. A high level of motor fitness is essential for success in all sports and games; yet, the extent and sequence of its components may differ based on the specific character of each sport or game. In competitive games and sports, it is essential to consider body composition and physiological characteristics, which significantly influence performance at advanced levels of competition. Body fat may be assessed using skinfold thickness measurements with skinfold calipers. Lean body weight may be derived from total body weight, which includes the body's fat. Lean body mass is largely stable in individuals, although fat mass may vary significantly. The body's fat content is substantially correlated with physical activity; athletes and other active individuals have lower obesity levels compared to sedentary individuals. Body composition pertains, in part, to an individual's obesity. In assessing this facet of body composition, overall weight is partitioned into two components: lean body mass and fat mass. Lean body mass comprises muscle, bone, and essential organs. The fundamental premise is that total weight is the sum of lean body mass and adipose body mass. The greater the proportion of fat, the higher the level of obesity.The physiological parameters being examined include pulse rate, blood pressure, and vital capacity. The heart rate serves as a straightforward and precise indicator of cardiovascular fitness. As an individual's fitness level improves, their heart rate will become slower, stronger, and more regular. Vital capacity has been utilized to assess the sufficiency of the respiratory system. While it assesses the lung's approximate capacity, new data suggests it is of limited utility in forecasting endurance performance capabilities. Repeated overloading of the respiratory system enhances the strength and endurance of the respiratory muscles, leading to increased lung capacity,

the development of additional alveoli, and consequently, a greater internal surface area for gas exchange with the circulatory system. This results in a diminished breathing rate at rest and a reduced rise in breathing rate during strenuous activity. Sports performance is contingent upon several aspects, including response time, balance, coordination, and movement speed, which are critical variables alongside other components of motor fitness. The decision has been made to undertake the current study.

Methodology:

A total of 30 male intercollegiate athletes who competed in an intercollegiate tournament were selected as subjects from Ranchi University, Ranchi, Jharkhand. The individuals' ages ranged from 18 to 25 years. Among 30 subjects, 10 were sprinters, 10 were jumpers, and 10 were long-distance runners. The purposive sample strategy was employed for the selection of individuals in the current investigation. Vital capacity, heart rate, blood pressure, and body composition were assessed according to feasibility criteria and equipment availability. Vital capacity was assessed using a dry spirometer, measured in liters. The pulse rate was measured as the number of pulsations per minute. Blood pressure, comprising systolic and diastolic measurements, was assessed using a sphygmomanometer and stethoscope in mmHg. Total body weight was measured in kg using a conventional weighing scale. The body fat percentage was determined by summing the skinfold thickness measurements in millimeters from designated sites: biceps, triceps, subscapular, and suprailiac, and then comparing the total to the reference chart provided by Durnin and Rehman. All acquired data was methodically organized in the table for subsequent statistical analyses.

Statistical analysis:

A one-way analysis of variance (ANOVA) statistical approach was utilized to determine the differences in chosen physiological characteristics between power athletes and long-distance runners. The results were interpreted based on the statistical findings. The significance level for testing the hypothesis was established at 0.05.

Results:

Table 1: Showing the comparison in physiological parameters amongst the groups.

Variable	Jumpers	Sprinters	Long-distance	ANOVA F-value (Sig)
Vital Capacity	521.42 ± 21.42	477.22 ± 24.67	467.29 ± 39.25	1.22 (NS)
Heart Rate	78.50 ± 1.87	76.89 ± 0.75	79.43 ± 0.97	0.63 (NS)
SBP	118.67 ± 1.26	121.44 ± 1.09	121.14 ± 0.59	1.94 (NS)
DBP	78.92 ± 0.84	79.67 ± 0.24	80.29 ± 0.29	1.08 (NS)

Table 1 indicates that jumpers possess a somewhat superior vital capacity (521.42) in comparison to sprinters and long-distance runners (79.43). Systolic and diastolic blood pressures exhibit comparable outcomes, with sprinters demonstrating a substantially elevated systolic pressure of 121.44, while long-distance runners have an insignificantly higher diastolic pressure of 80.29.

Table 2: Showing the comparison in body composition parameters amongst the groups.

Variable	Jumpers	Sprinters	Long-distance	ANOVA F-value (Sig)
Fat percentage	12.54 ± 1.23^{a}	10.74 ± 0.56^{a}	8.38 ± 0.61^{b}	4.004 ($p<0.05$)
Lean body mass	62.23 ± 3.31^{a}	58.50 ± 2.65^{a}	48.56 ± 1.58^{b}	5.08 ($p<0.05$)
Body density	1.07 ± 0.0^{b}	1.07 ± 0.0^{b}	1.08 ± 0.0^{a}	4.04 ($p<0.05$)

Table No. 2 demonstrated the characteristics of body fat percentage, lean body mass, and body density of the studied groups. Table 2 clearly demostrated that the body fat of all the studied groups were below 15 percenatages. The jumpers groups showed significantly ($p<0.05$) highest (12.54) body fat percentage. The long distance runner showed significantly ($p<0.05$) low fat percentages. In contrast, jumpers showed significantly high level of body fat percentages as compare to that of sprinters and long distance runners.Lean body mass of jumpers and sprinters are significantly ($p<0.05$) higher (62.23) as compare to that of long distance runners (48.56) amongst the studied groups. In contrast, the long distance runners depicted statistically ($p<0.05$) leaner than that of jumpers and sprinters.

Findings and Discussion:

The current study found no significant differences in VC, HR, SBP, and DBP among jumpers, sprinters, and long-distance runners. The prior study (Saxena, 2017) contradicts the findings of the current study. Bolomfield and Sigemeth (1965) demonstrated that middle-distance swimmers had a stronger vital capacity and pulse rate compared to sprinters, but sprint swimmers have a higher systolic blood pressure than middle-distance swimmers. Bhowmik (1987) discovered that the vital capacity of soccer players was markedly superior to that of Kabaddi players. Moreover, the basal pulse rate of soccer players was significantly lower than that of other individuals. Conversely, the systolic and diastolic blood pressure of soccer and kabaddi players were practically identical and statistically insignificant. Ajmer and Jagta (1988) established that the cardio-pulmonary index was elevated in cross-country runners. Christine et al. (1980) observed that experienced male and female marathon runners (7 males and 4 females) possess more lean body mass, with no significant variations in aerobic ability.

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