



Comparative Analysis of Body Fat Percentage and Lean Body Mass in Long-Distance Runners and Weightlifting Athletes

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Abstract

Background: Body composition, including body fat percentage and lean body mass, significantly impacts athletic performance and overall health. Long-distance running and weightlifting athletes leads to distinct physiological adaptations. This study aims to elucidate the disparities in body fat percentage and lean body mass between these two groups, providing insights that are essential for tailoring sport-specific training and health management strategies.

Objective: The study aimed to examine the body fat percentage and lean body mass of athletes who engage in weightlifting and long-distance running.

Study Design: This research utilized an observational cross-sectional design.

Material and Methods: In this study, 60 university-level male sports persons were selected as subjects with long-distance runners (n = 30) and weightlifting athletes (n = 30). To achieve the purpose of the study, Body composition analyser GS6.5B Body Building Weight Test System (Version 1.0) was used to analyze the body fat percentage and lean body mass of the subjects.

Results: This study found that there exists a significant difference in body fat percentage and lean body mass among weightlifting athletes and long-distance runners. The t-value with regards to the variable body fat percentage was 3.70 and p-value was 0.0005 and was found to be statistically significant at 0.05 level of significance $p < .05$. The t-value with regards to lean body mass was 8.392 and p-value was 0.0001 and was found to be statistically significant at 0.05 level of significance $p < .05$.

Conclusion: The findings of the investigation demonstrated considerable dissimilarity in the percentage of body fat and lean body mass between long-distance runners and weightlifting athletes. In particular, weightlifting athletes exhibited a higher body fat percentage and greater lean body mass than those in the long-distance running group.

Keywords: Body Composition Analysis; Body Fat Percentage; Lean Body Mass; Long-Distance Runners; Weightlifting Athletes

Introduction

Body composition entails analysing the human body on the basis of fractionation of total body mass. In sports, the body composition assessment plays a vital role since it can ascertain the athletic potential and success in a particular sport combined with functional, physical and psychosocial factors [1,2]. In sports, body fat must be observed, as suitable levels of fat ensure effective movement of players during training and in game. Lean mass, particularly muscle mass, must also be observed, as unsuitable training loads can cause unwanted fluctuations in physique, which could affect speed, power, strength and risk of injury [3], [4].

Sports activity types can have significant changes in body composition. Each particular sports discipline requires a specific type of training and physical activity that affects athletes body composition; therefore, applying a rigid notion of optimal body composition to every sport is impossible [5]. Strategies to achieve the best possible physique for each sports discipline form part of a comprehensive method to explore the performance of the athletes. To achieve this purpose, recent studies conducted on athletes emphasized the need for reference data for evaluating the body composition of athletes of various sports, with or without physical impairments [6,7]. In the absence of suitable references for each sport group, researchers continue to use reference standards from the overall healthy population [8].

Body composition, a critical determinant of overall health and athletic performance, is influenced by a complex interplay of genetic, environmental, and behavioural factors [9]. Understanding the nuances of body composition is essential for optimizing athletic performance, promoting overall health and preventing chronic diseases, such as obesity, diabetes, and cardiovascular diseases [10]. Many studies have explored the impact of various lifestyle factors including diet and physical activity on body composition [11,12]. However, the specific differences in body composition between athletes engaged in distinct training paradigms, such as endurance and resistance training, remain an area of significant interest [13]. By examining these distinct groups, this study aimed to elucidate the influence of training modality on body composition and to contribute to the existing body of knowledge in this field. Specifically, this study sought to investigate disparities in body fat percentage and lean body mass between long-distance runners and weightlifting athletes in two highly specialized athletic populations.

This study’s findings will benefit athletes and the general population by informing personalized exercise recommendations and promoting healthier lifestyles.

Methodology and Procedure

Selection of subjects

To achieve the study’s purpose, 60 university-level male participants, with long-distance runners (n = 30) and weightlifting athletes (n = 30) were selected as subjects. The subjects ranged in age from 18 to 25 years, and at the very least, they had participated in inter-university level competitions for their respective sports. All the subjects were informed about the objective and protocol of the study, and after their consent, they voluntarily participated in this study.

Operational definitions

- **Long-Distance Runners:** For the purposes of this study, long-distance runners are defined as athletes who regularly participate in running events of 3,000 meters or more. This ensures that participants are experienced in endurance running, which involves sustained aerobic effort [14].
- **Weightlifting Athletes:** Weightlifting athletes are defined as individuals who engage in weightlifting as their primary sport, focusing on lifting heavy weights using free weights such as barbells and dumbbells. For this study, weightlifting athletes are those who have participated in weightlifting competitions at the interuniversity level, emphasizing their involvement in resistance training to develop muscular strength and mass [15].

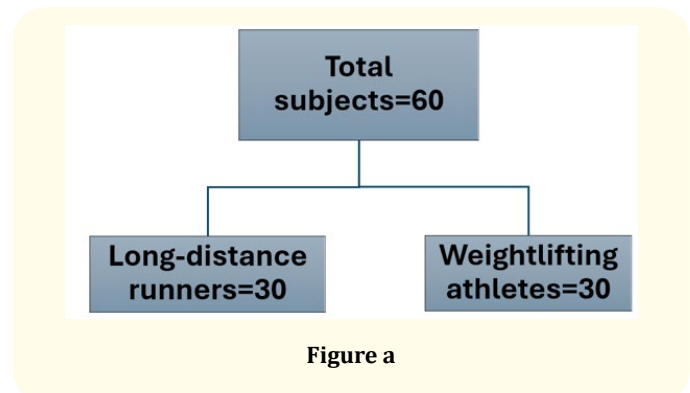


Figure a

Inclusive and exclusive criteria

The participants included in the study were healthy and free from any musculoskeletal problems. Any subject having any health problem or medical condition was excluded from the study. The study included athletes who have participated in their respective sports at the interuniversity level.

Selection of variables

The following variables were selected to accomplish the objectives of the study.

- Body Fat (%)
- Lean Body Mass (kg)

Instruments used

Body composition analyzer GS6.5B Body Building Weight Test System (Version 1.0).

Criteria measure

Body composition analyser

The body composition analyzer was used to measure the body fat percentage and lean body mass of the defined population. The test was conducted in the physiology lab department of physical education Punjabi University Patiala. The subjects were instructed clearly about the test procedure and cleared any doubt, if any. The test administrator instructed the participants to remove their shoes and socks and stand on the machine with bare feet at designated locations. Additionally, the participant was instructed to hold the electrodes firmly with both hands, keep their arms straight, and maintain that posture until the machine took readings. The responsibility for recording all measurements was assigned to the lab technician. The data was carefully recorded and descriptive statistical technique t-test was employed to analyze the difference between the groups [16].

Analysis and interpretation of the data

Groups	N	MEAN	SD	SEM	T value	P value
Long-distance runners	30	16.53	2.23	0.503	3.70	0.0005
Weightlifting athletes	30	18.95	2.70	0.416		

Table 1: Descriptive statistics of Body fat percentage of long-distance runners and weightlifting athletes.

Table 1 shows the mean and standard deviation (MEAN ± SD) regarding the variable body fat percentage of long-distance runners i.e., 16.53 ± 2.23 and 18.95 ± 2.70 for the weightlifting athletes. The t-value with regards to the body fat percentage was 3.70 and the p-value was 0.0005 and was found to be statistically significant at 0.05 level of significance p<.05.

Table 2 shows the mean and standard deviation (MEAN ± SD) regarding the variable lean body mass of long-distance runners i.e., 49.113 ± 4.341 and 59.587 ± 5.281 for weightlifting athletes. The t-value with regards to the lean body mass was 8.392 and p-value was 0.0001 and was found to be statistically significant at 0.05 level of significance p<.05.

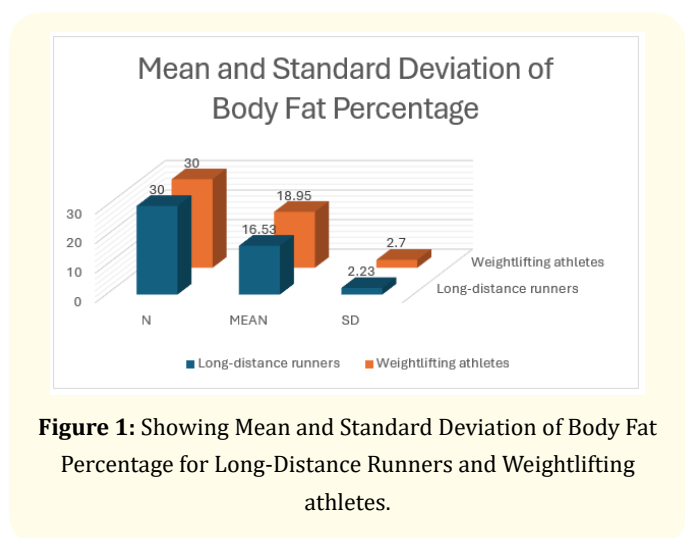


Figure 1: Showing Mean and Standard Deviation of Body Fat Percentage for Long-Distance Runners and Weightlifting athletes.

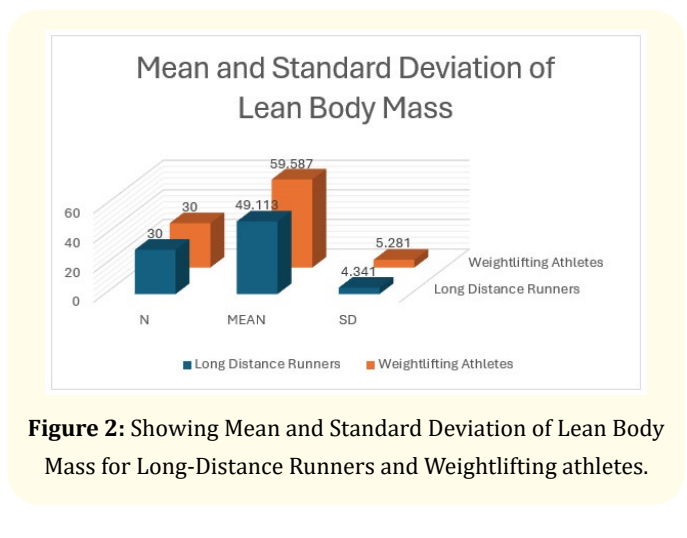


Figure 2: Showing Mean and Standard Deviation of Lean Body Mass for Long-Distance Runners and Weightlifting athletes.

Groups	N	MEAN	SD	SEM	T value	P value
Long Distance Runners	30	49.113	4.341	0.792	8.392	0.0001
Weightlifting Athletes	30	59.587	5.281	0.964		

Table 2: Descriptive Statistics of Lean Body Mass of Long-Distance Runners and Weightlifting athletes.

Results

This research uncovered a notable difference in body fat percentage and lean body mass between weightlifting athletes and long-distance runners. It is essential to recognize that weightlifting, the primary focus of this study, constitutes a specialized form of resistance training. Weightlifting entails the execution of exercises using free weights, such as barbells and dumbbells, to increase muscular strength and hypertrophy. Consequently, the weightlifters included in this study were engaged in resistance training as a fundamental aspect of their athletic regimen [15]. The differences in body fat percentages and lean body mass between weightlifting athletes and long-distance runners align with the study [17], which revealed that resistance training is essential for programs aimed at increasing lean mass in middle-aged, overweight/obese individuals, while aerobic training is the most effective type of exercise for reducing fat mass and body mass.

The significant difference in body fat percentage between the two groups highlights the potential of aerobic exercises like long-distance running to increase fat loss. This could be attributed to the prolonged energy expenditure and increased metabolic rate associated with long-distance running [18]. In contrast, while resistance training does contribute to fat loss, its primary effect appears to be on muscle mass accretion rather than substantial reductions in body fat [17].

These findings have important implications for both athletes and the general population. For individuals aiming to decrease body fat, incorporating aerobic exercises such as long-distance running may be more effective, on the other hand, those looking to increase muscle mass and strength should consider resistance training. This study supports the notion that a combination of both training modalities may provide a balanced approach to achieving optimal body composition [19].

Despite the insights provided by this study, several limitations should be noted. Factors such as diet, training intensity, and

duration were not accounted for and could have influenced the results. It is important to clarify that this study is observational and not experimental, with no treatments or interventions applied. To address these limitations, future research could employ longitudinal studies to track changes over time, explore these variables more comprehensively, and investigate the underlying mechanisms driving the observed differences in body composition.

Conclusion

In conclusion, this study highlights the divergent impacts of long-distance running and weightlifting on body composition. Long-distance running appears to be more effective in reducing body fat, while weightlifting is more beneficial for increasing lean body mass. These findings underscore the importance of selecting exercise modalities aligned with individual fitness goals and suggest that a balanced approach incorporating both types of exercise may offer the most comprehensive benefits for overall health and athletic performance.

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