

A Comparative Anthropometric Study of Elite Indian and International Cyclists

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ABSTRACT

Background: The present study is conducted to understand the anthropometric differences between Elite Indian cyclists competing at the national and international levels in road and track events. **Methods:** In this study, the top five elite Indian nationals (TOPS Indian Cyclists) and international cyclists from various events (both road and track events) were taken. Anthropometric variables such as Age (in years), body height (in centimeters), body weight (in kilograms), and body mass index (kg/mtr²) of each cyclist were recorded, analyzed, and compared statistically at national and international levels event-wise. **Results:** In road events, Indian cyclists were found to be 2.0 years older, 2cm taller, 8.0 kg heavier, and 2 units higher in BMI than international road cyclists. However, in track events, Indian cyclists were recorded as 13 years younger, 3.4 cm shorter in height, 7 kg lighter in weight, and 0.7 units lower in BMI (indicating lower weight relative to height) as compared to international track cyclists. **Conclusion:** The study concludes that Indian elite cyclists in road events tend to be older, taller, heavier, and have higher BMI as compared to international road cyclists, while in track events, Indian cyclists are younger, shorter, lighter, and exhibit a lower BMI as compared to international track cyclists, indicating significant anthropometric variations at national and international level between two groups. These findings highlight the reverse trends in anthropometric characteristics between road and track events for national and international cyclists.

Keywords: Anthropometric Variables, Road and Track Cyclists, Body Height, Weight, BMI

INTRODUCTION

Anthropometric factors, including body height, weight, and body mass index (BMI), have been recognized as crucial determinants of sports performance in various disciplines, including cycling. Anthropometry provides valuable insights into athletes' physical character-

istics, which can influence their biomechanics, physiological capacities, and overall athletic potential (Claessens et al., 2020; Norton et al., 2018). Understanding the differences in anthropometric variables between athletes competing at different levels and

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in different events can provide valuable information for talent identification, training program design, and performance optimization.

In cycling, previous studies have examined the relationship between anthropometric variables and performance outcomes, such as cycling power, speed, and endurance. These studies have shown that specific anthropometric characteristics may confer advantages or disadvantages to cyclists, depending on the event and discipline (de la Fuente et al., 2020; Hausswirth et al., 2010). For instance, in road cycling, a higher body mass index (BMI) combined with higher total power output may be advantageous for generating sustained power during long-distance events (Padilla et al., 2017). In contrast, track cycling events typically involve shorter distances and higher speeds and may favor athletes with lower body weight and a more favorable power-to-weight ratio (Takaishi et al., 2019). While several studies have investigated the anthropometric profiles of cyclists from various countries, limited research focuses specifically on Indian cyclists. India has a growing presence in international cycling competitions, with athletes representing the country at national and international levels. Understanding the anthropometric characteristics of Indian cyclists competing in different events and comparing them with their international counterparts is crucial for assessing their competitive potential and identifying areas for improvement. Therefore, the present study aimed to examine the differences in anthropometric variables between Indian cyclists competing at the national and international levels in road

and track events. By comparing the age, body height, weight, and BMI of elite Indian national and international cyclists.

METHODOLOGY

This study aimed to compare the anthropometric variables of national and international level road and track cyclists. The study focused on two groups: elite Indian national cyclists, specifically those training at the Target Olympic Podium Scheme (TOPS) in New Delhi (2022-23), and international cyclists participating in various road and track events. The anthropometric variables considered in this study included age (in years), body height (in centimeters), body weight (in kilograms), and the derived variable of body mass index (BMI) calculated as kilograms per square meter (kg/m²). The student's t-test, a statistical test for comparing the means of two groups, was employed to analyze and compare the data. This allowed for a quantitative assessment of the anthropometric characteristics of both Indian and international cyclists with their performance levels and event specialization.

RESULTS AND DISCUSSION

The present study was conducted on elite Indian and international road and track cyclists. The following variables were analyzed to see the anthropometrical differences between Indian and international elite cyclists.

Age (years): Table and Figure 1 present the mean age of elite Indian and international cyclists. In road events, the average age of Indian cyclists was 31.2 years, slightly higher than international road cyclists, with an average age of 29.2

years. This indicates that Indian road cyclists tend to be, on average, two years older than their international counterparts. On the other hand, the analysis of track events showed a significant contrast. The mean age of elite Indian track cyclists was 20.6 years, which was remarkably lower compared to the international track cyclists, with a mean age of 33.0 years. This striking age difference of 12.4 years indicates that international track cyclists have considerably more experience and maturity in their competitive careers than their Indian counterparts.

Body Height (cm): The mean body height of elite Indian and international road cyclists was analyzed and compared in this study. The results showed that the average body height of Indian road cyclists was 176.8 cm, 2 cm taller than the international road cyclists with an average height of 174.8 cm. This indicates that Indian road cyclists, on average, have a slightly greater stature than their international counterparts. However, when examining track events, an opposite trend emerged. The mean body height of elite

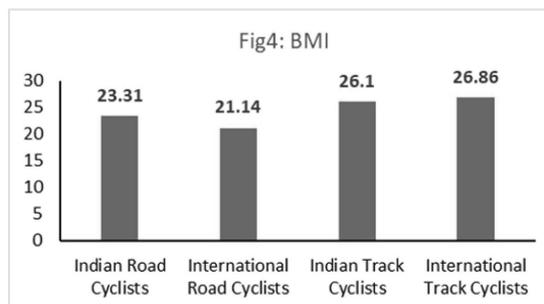
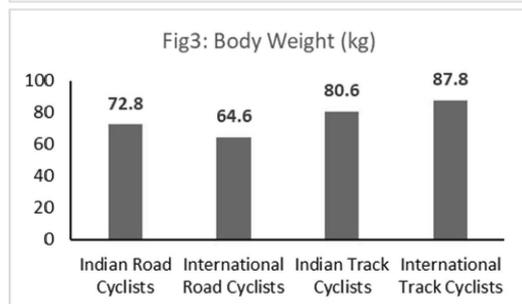
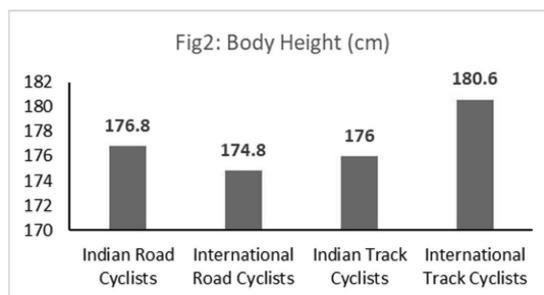
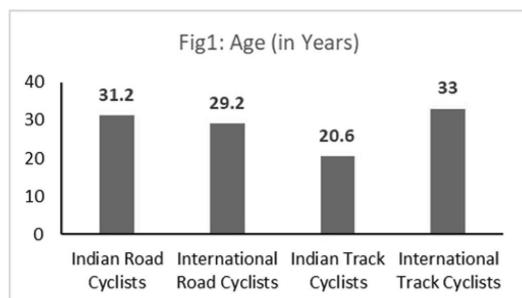
Indian track cyclists was 176 cm, 3.4 cm shorter than the international track cyclists, with an average height of 180.6 cm. This reveals that in track events, Indian elite cyclists tend to be shorter in stature relative to their international competitors. The findings of this study highlight the reverse trends in body height between road and track events among Indian and international elite cyclists. While Indian road cyclists are slightly taller than International road cyclists, Indian track cyclists are comparatively shorter than international track cyclists. These variations in body height may have implications for cyclists' biomechanics, aerodynamics, and overall performance capabilities in different event categories.

Body Weight (kg): The average body weight of Indian road cyclists was 72.8 kg, 8 kg heavier than the average weight of international road cyclists, recorded as 64.6 kg. This indicates that Indian road cyclists, on average, have a higher body weight than their international counterparts. However, when focusing on track events, a reverse trend emerged. The mean body weight of elite Indian track

Table 1: Anthropometric Variables of Elite Indian and International Male Road and Track Cyclists

Sports/Events	Indian Road Cyclists (N=05)		International Road Cyclists (N=05)		t-values	Indian Track Cyclists (N=05)		International Track Cyclists (N=05)		t-values
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Age (in Years)	31.2	4.55	29.2	5.59	0.84 ^{NS}	20.6	1.14	33.0	7.97	4.64*
Body Height (cm)	176.8	5.07	174.8	2.86	1.04 ^{NS}	176	6.12	180.6	4.56	1.82 ^{NS}
Body Weight (kg)	72.8	9.18	64.6	3.85	2.48*	80.6	8.44	87.8	8.32	1.83 ^{NS}
BMI	23.31	3.11	21.14	1.18	1.97*	26.1	3.23	26.86	1.36	0.65 ^{NS}

*Significant at 5% level (1.833); NS: Non-Significant.



cyclists was reported as 80.6 kg, 7 kg lighter than the average weight of international track cyclists, recorded as 87.8 kg.

Body Mass Index (kg/m²): The average BMI of Indian road cyclists was 23.31 kg/m², which was 2 units higher compared to the average BMI of international road cyclists, recorded as 21.14 kg/m². This indicates that Indian road cyclists, on average, have a higher BMI to their height when compared to their international counterparts. However, when considering track events, an opposite trend was observed. The mean BMI of elite Indian track cyclists was 26.1 kg/m², 0.7 units lower (indicating lower weight relative to height) than the average BMI of international track cyclists, recorded as 26.86 kg/m². The study highlights the reverse trends in body mass index between road and track events among Indian and international elite cyclists. Indian road cyclists have a higher BMI to their height, indicating a relatively heavier weight than

their international counterparts. On the other hand, Indian track cyclists exhibit a lower BMI, suggesting a relatively lighter weight to their height when compared to international track cyclists. These findings shed light on the variations in body composition and weight distribution among elite cyclists in different event categories. The differences in BMI may have implications for factors such as power-to-weight ratio, endurance, and overall road and track cycling performance.

CONCLUSION

The current study examines the anthropometric differences between elite Indian and international cyclists in road and track events. The findings indicate that Indian road cyclists are typically older, taller, heavier, and possess a higher BMI compared to their international counterparts. In contrast, Indian track cyclists are younger, shorter, lighter, and

exhibit a lower BMI. These results are consistent with studies suggesting that body composition and anthropometric traits vary significantly across cycling disciplines and levels of competition (Claessens et al., 2020; Foley et al., 1989).

Indian road cyclists' older age and higher BMI may confer advantages in endurance events, where higher muscle mass and sustained power output are essential (Mujika & Padilla, 2001). Conversely, the younger age and lighter weight of Indian track cyclists suggest an emerging talent pool that still lags in terms of experience compared to their international counterparts (Singh & Sidhu, 1982). These variations are in line with global trends, where road cyclists tend to have higher BMIs due to the demands of long-distance racing, while track cyclists benefit from a lower body mass that optimizes acceleration and speed (Hauswirth et al., 2010; de la Fuente et al., 2020).

Furthermore, the contrasting anthropometric profiles between Indian and

international cyclists in both events underscore the importance of discipline-specific training and nutrition programs. Research by Tanner (1964) and McLean & Parker (1989) emphasizes that tailored interventions aimed at optimizing athletes' body composition can significantly improve performance. Indian cycling authorities may benefit from implementing more specialized talent identification and training strategies, focusing on the physical attributes critical to each event (Norton et al., 2018).

Furthermore, future research should delve deeper into the physiological and biomechanical factors contributing to these anthropometric differences, particularly in the context of Indian athletes. With the growing participation of Indian cyclists in international competitions, understanding the role of genetics, training methodologies, and nutrition will be vital for bridging performance gaps and fostering competitive success on the global stage (Carter, 1982; Padilla et al., 1999).

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