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Demographic Profile and Performance Analysis of Triple Jumpers at the Indian National Federation Cup Athletics Championship

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***Abstract*-- This study describes the demographic, anthropometric, and performance profile of seven male triple jumpers who competed at the Indian National Federation Cup Athletics Championship 2022, and examines the statistical relationship between chronological age, training age, and selected anthropometric variables with triple jump performance. Subjects (N = 7) ranged in chronological age from 21 to 29 years (M = 25.43, SD = 2.94) and in training age from 6 to 13 years (M = 9.86, SD = 2.34). Descriptive statistics computed on 31 valid competition trials showed a mean performance of 16.250 m (SD = 0.397, SE = 0.071; range 15.700–16.990 m). Pearson product-moment correlation revealed a moderate, statistically non-significant positive relationship between chronological age and personal best performance (r = 0.673, p = .098) and between training age and personal best performance (r = 0.576, p = .176), while height (r = −0.380, p = .400) and weight (r = 0.059, p = .900) showed negligible association with performance. A significant positive relationship was observed between chronological age and training age (r = 0.835, p = .019). The findings suggest that, within this elite cohort, accumulated training experience and competitive maturity may be more closely linked to performance than static anthropometric dimensions, although the small sample size limits statistical power and generalisability. Implications for long-term athlete development and talent identification in Indian triple jump are discussed.**

***Keywords*-- triple jump, Federation Cup, training age, chronological age, athletic performance, Indian athletics**

I. Introduction

Triple jump is a technically demanding horizontal jumping event in which competitive performance is the product of an athlete's approach velocity, take-off mechanics, and the coordinated distribution of the hop, step, and jump phases (Hay, 1992). Because the event places high mechanical and neuromuscular demands on the lower limb, performance at the elite level is typically the outcome of prolonged, systematic training rather than a single physical attribute (Perttunen, Kyröläinen, Komi, & Heinonen, 2000).

In the Indian context, the Federation Cup National Athletics Championship serves as one of the principal selection and benchmarking competitions through which the country's best triple jumpers are identified for international representation.

A demographic and performance profile of athletes competing at this level provides a useful baseline against which talent identification, training age norms, and long-term athlete development (LTAD) pathways can be evaluated. While chronological age indicates biological maturity in a general sense, training age — the number of years of systematic, organised training — is often considered a more direct indicator of an athlete's developmental stage and readiness for elite performance (Bompa & Buzzichelli, 2019). Examining how these two variables, along with basic anthropometric measures such as height and weight, relate to competitive performance can therefore offer coaches and sports scientists working within the Indian athletics system practical insight for athlete monitoring and selection.

II. Statement Of The Problem

The problem was stated as follows: "A study on the demographic profile and its relationship with triple jump performance of athletes participating in the Indian National Federation Cup Athletics Championship." The study sought to document the chronological age, training age, height, weight, and personal best performance of the male triple jump competitors at the Federation Cup, and to statistically examine the extent to which these variables were associated with competitive performance.

III. Objectives Of The Study

- To document the demographic and anthropometric profile (date of birth, chronological age, training age, height, and weight) of athletes participating in the triple jump event at the Indian National Federation Cup Athletics Championship.

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- To compute descriptive statistics (mean, standard deviation, standard error, and range) for triple jump performance among the sampled athletes.
- To examine the relationship between chronological age and triple jump performance.
- To examine the relationship between training age and triple jump performance.
- To examine the relationship between selected anthropometric variables (height and weight) and triple jump performance.

IV. Hypotheses

4.1 Research Hypotheses (H_1)

- H_1a: There will be a significant positive relationship between chronological age and triple jump performance.
- H_1b: There will be a significant positive relationship between training age and triple jump performance.
- H_1c: There will be a significant relationship between height and weight and triple jump performance.

4.2 Null Hypotheses (H_0)

- H_0a: There will be no significant relationship between chronological age and triple jump performance.
- H_0b: There will be no significant relationship between training age and triple jump performance.
- H_0c: There will be no significant relationship between height and weight and triple jump performance.

V. Methodology

5.1 Selection of Subjects (Sampling)

A total enumeration (purposive census) sampling method was employed. All seven (N = 7) male athletes who competed in the triple jump event at the Indian National Federation Cup Athletics Championship 2022 constituted the subjects of the study. Because the population of national-level Federation Cup triple jump finalists in a given competition year is inherently small and finite, total enumeration was considered the most appropriate sampling strategy rather than random or stratified sampling. For the analysis of performance distribution, the best valid legal trials (N = 31) recorded by these athletes across the qualification and final rounds of the competition were compiled from official competition records.

5.2 Selection of Variables

- Chronological Age (years) — calculated from the date of birth to the date of competition.
- Training Age (years) — the number of years of systematic, organised triple jump training, obtained from athlete/coach records.
- Height (m) — measured using a standard stadiometer, recorded to the nearest 0.01 m.
- Weight (kg) — measured using a calibrated digital weighing scale, recorded to the nearest 0.1 kg.
- Triple Jump Performance (m) — the official personal best and individual valid trial distances recorded by Federation Cup technical officials using standard IAAF/World Athletics measurement protocol.

5.3 Statistical Procedure

Descriptive statistics (mean, standard deviation, standard error, minimum, and maximum) were computed for the demographic variables and for triple jump performance. The Pearson product-moment correlation coefficient (r) was used to examine the linear relationship between chronological age, training age, height, and weight with personal best triple jump performance, and between chronological age and training age. The level of significance was set at $p < 0.05$ for all statistical tests. Data were compiled and analysed using standard statistical procedures consistent with IBM SPSS Statistics conventions.

VI. Results

Table 1 presents the demographic and anthropometric profile of the seven athletes who competed in the triple jump event at the Federation Cup.

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Table 1. Demographic Profile of Athletes Participating in the Indian National Federation Cup Championship

Sl. No.	Date of Birth	Name of Athlete	Age (yrs)	Training Age (yrs)	Height (m)	Weight (kg)	Personal Best (m)
1	xxx	X	26	12	1.77	68	16.81
2	yyy	Y	21	6	1.77	69	16.5
3	zzz	Z	26	9	1.73	66	16.99
4	aaa	A	28	11	1.77	69	16.64
5	bbb	B	26	9	1.75	66	16.36
6	ccc	C	29	13	1.78	70	17.1
7	ddd	D	22	9	1.8	69	16.2

The chronological age of the athletes ranged from 21 to 29 years (M = 25.43, SD = 2.94), and training age ranged from 6 to 13 years (M = 9.86, SD = 2.34). Height ranged from 1.73 m to 1.80 m (M = 1.77, SD = 0.02), and body weight ranged from 66 kg to 70 kg (M = 68.14, SD = 1.57).

Personal best performances ranged from 16.20 m to 17.10 m (M = 16.66, SD = 0.33), confirming that the sampled athletes were competitive, elite-level triple jumpers.

Table 2 presents the descriptive statistics of the 31 valid triple jump trials recorded across the competition.

Table 2. Descriptive Statistics of Triple Jump Performance of National Triple Jumpers

Variable	N	Mean	SD	SE	Lowest Score	Highest Score
Triple Jump Performance (m)	31	16.250	0.397	0.071	15.700	16.990

The mean triple jump performance across all valid trials was 16.250 m, with a standard deviation of 0.397 m and a standard error of 0.071.

The lowest and highest recorded trial distances were 15.700 m and 16.990 m respectively, indicating a performance spread of 1.29 m across the sample of trials.

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Figure 1. Distribution of Triple Jump Performance (N = 31)

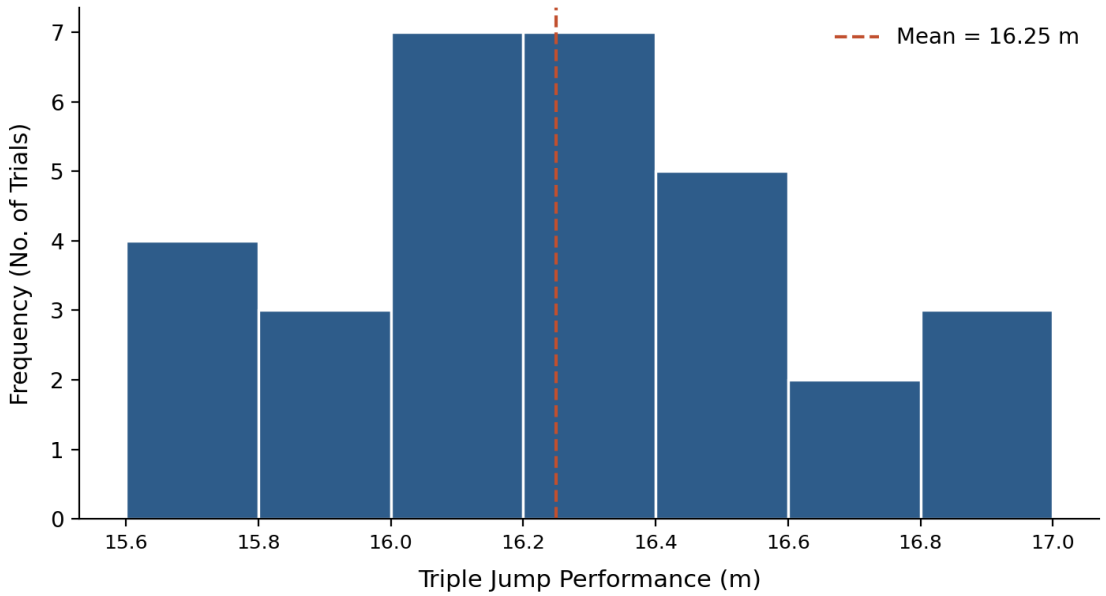

Figure 1 illustrates the frequency distribution of the 31 valid triple jump trials. The distribution shows a broadly symmetric, unimodal pattern clustered around the 16.0–16.4 m range, with the mean performance (16.25 m) falling close to the centre of the distribution.

Table 3 presents the Pearson correlation coefficients examined between the demographic variables and personal best performance.

Table 3. Pearson Correlation Between Demographic Variables and Triple Jump Personal Best Performance (N = 7)

Variables Correlated	N	Pearson r	R^2	p-value	Remark
Chronological Age × Personal Best	7	0.673	0.453	0.098	Not significant ($p > .05$)
Training Age × Personal Best	7	0.576	0.332	0.176	Not significant ($p > .05$)
Height × Personal Best	7	−0.380	0.144	0.400	Not significant ($p > .05$)
Weight × Personal Best	7	0.059	0.003	0.900	Not significant ($p > .05$)
Chronological Age × Training Age	7	0.835	0.698	0.019	Significant ($p < .05$)

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Figure 2. Training Age vs. Personal Best Performance

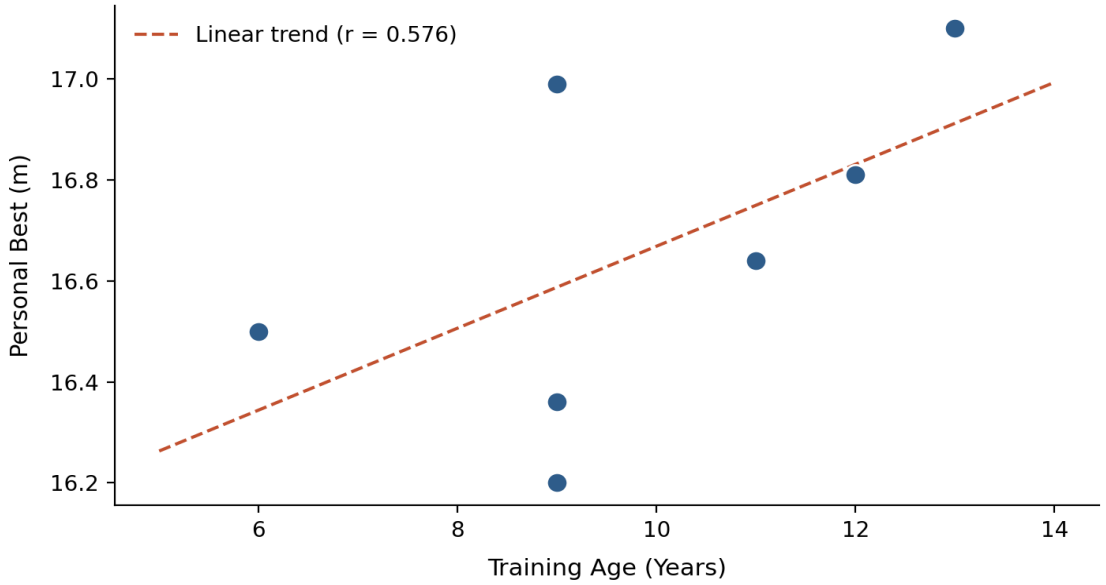

Figure 2 presents the scatter relationship between training age and personal best performance, together with the linear trend line, illustrating the moderate positive association observed between the two variables.

VII. Analysis And Discussion Of Findings

The correlation analysis indicated a moderate positive relationship between chronological age and personal best performance ($r = 0.673$, $r^2 = 0.453$), suggesting that age accounted for approximately 45% of the variance in performance within this sample; however, this relationship did not reach statistical significance ($p = .098$) at the 0.05 level. Similarly, training age showed a moderate positive relationship with performance ($r = 0.576$, $r^2 = 0.332$, $p = .176$). Given the very small sample size ($N = 7$), both relationships lacked the statistical power required to reach conventional significance despite showing a practically meaningful trend, and the null hypotheses H_{0a} and H_{0b} are therefore retained on statistical grounds while the observed effect sizes are noted as practically relevant.

Height ($r = -0.380$, $p = .400$) and weight ($r = 0.059$, $p = .900$) showed weak and statistically non-significant relationships with performance, and the null hypothesis H_{0c} is retained. This finding is consistent with the biomechanics literature on triple jump, which emphasises approach run velocity, take-off technique, and hop–step–jump phase distribution as the principal determinants of performance rather than static anthropometric dimensions such as stature and body mass (Hay, 1992; Perttunen et al., 2000; Panoutsakopoulos & Kollias, 2008).

A statistically significant positive relationship was found between chronological age and training age ($r = 0.835$, $p = .019$), indicating that, within this cohort, older athletes had accumulated proportionally more years of systematic training. This is consistent with long-term athlete development (LTAD) models, which propose that elite performance in technically complex jumping events is typically reached only after eight to ten or more years of progressive, structured training (Bompa & Buzzichelli, 2019), a pattern reflected in the present sample's mean training age of 9.86 years.

Taken together, the findings suggest that, while age and training experience showed a practically meaningful positive trend with triple jump performance in this elite cohort, the relationship could not be confirmed as statistically significant with the available sample size. This underscores a recurring methodological challenge in high-performance sport research in India, where the population of athletes competing at the national elite level in a single event is inherently small.

VIII. Conclusion

Within the limitations of the study, it was concluded that the male triple jumpers competing at the Indian National Federation Cup Athletics Championship were, on average, mature athletes (M age = 25.43 years) with substantial competitive training experience (M training age = 9.86 years). Mean personal best performance across the sample was 16.66 m, and the mean of all valid competition trials analysed was 16.25 m.

Chronological age and training age each showed a moderate positive, though statistically non-significant, association with performance, whereas height and weight showed negligible association. Chronological age and training age were themselves significantly and strongly correlated, consistent with the expected accumulation of training experience with athlete maturity.

IX. Recommendations

- Future studies should replicate this analysis with a larger sample drawn across multiple Federation Cup and national championship cycles to improve statistical power.
- Longitudinal tracking of individual athletes' age, training age, and performance across seasons is recommended to better establish developmental trends.
- Biomechanical and technical variables (approach run velocity, hop–step–jump phase ratios, take-off angle) should be incorporated in future research to more directly capture the determinants of triple jump performance.
- Training age norms derived from larger elite samples could usefully inform talent identification and long-term athlete development planning within Indian athletics.

X. Limitations Of The Study

- The sample was restricted to seven male athletes from a single competition (Federation Cup 2022), limiting statistical power and generalisability.
- Training age was based on available athlete/coach records and was not independently verified through a standardised training-history instrument.
- Biomechanical and technical performance determinants were outside the scope of this study.

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