A Comparative Study of Selected Anthropometric Measurements of Inter-Collegiate Women Weightlifters and Powerlifters of Mangalore University

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ABSTRACT

Strength-oriented sports require specific physical characteristics that support efficient force production and movement execution. Variations in technical demands between Olympic weightlifting and powerlifting are known to influence anthropometric profiles of athletes (Garhammer, 1993; Keogh et al., 2006). The present investigation examined selected anthropometric measurements of inter-collegiate women weightlifters and powerlifters representing Mangalore University.

A comparative research approach was adopted, involving sixty women athletes (30 weightlifters and 30 powerlifters) selected through purposive sampling. Standard anthropometric measurements including body dimensions, circumferences, and skinfold thickness were recorded using validated procedures (Ross & Marfell-Jones, 1991). Descriptive statistics and independent sample t-tests were applied to identify group differences at the 0.05 level of significance.

The findings indicated no meaningful difference in standing height between the two groups. However, women weightlifters demonstrated significantly higher values in body weight, arm length, upper arm length, chest circumference, thigh circumference, calf circumference, and waist skinfold thickness. No statistically significant differences were observed in lower arm length, thigh skinfold thickness, or calf skinfold thickness.

It was concluded that participation in Olympic weightlifting is associated with more pronounced anthropometric characteristics related to muscularity and leverage compared to powerlifting. The results emphasize the importance of anthropometric assessment for sport-specific training and athlete development among women strength athletes.

Keywords: Anthropometric Characteristics; Women Weightlifters; Powerlifters; Strength Sports; University Athletes

INTRODUCTION

Performance in strength-based sports is strongly influenced by the interaction between muscular capacity and body structure. Anthropometric attributes such as limb length, body mass, muscular girths, and fat distribution affect leverage, joint mechanics, and force transmission during lifting activities (Ross & Marfell-Jones, 1991; Ciroslan et al., 2006). Consequently, systematic evaluation of these characteristics has become an essential component of modern sports performance analysis.

Olympic weightlifting and powerlifting represent two distinct strength disciplines with contrasting biomechanical demands. Weightlifting emphasizes rapid force production and coordinated movement patterns during the snatch and clean and jerk, whereas powerlifting focuses on controlled maximal force output in the squat, bench press, and deadlift (Garhammer, 1993; Keogh et al., 2006). These differences are expected to promote sport-specific physical adaptations over time.

Previous investigations have demonstrated that anthropometric variables such as limb dimensions, lean body mass, and muscular girths are closely associated with lifting performance (Ciroslan et al., 2006; Marefat Siahkouhian et al., 2016). Despite increased participation of women in strength sports in India, limited empirical research has examined anthropometric differences between women weightlifters and powerlifters at the university level. Addressing this gap, the present study aimed to compare selected anthropometric characteristics of inter-collegiate women athletes of Mangalore University.

REVIEW OF LITERATURE

Research in strength sports has consistently emphasized the relevance of anthropometric characteristics in determining performance outcomes. Studies on competitive weightlifters have shown that greater limb lengths, muscular girths, and lean body mass contribute to improved mechanical efficiency during explosive lifts (Ciroslan et al., 2006; Marefat Siahkouhian et al., 2010). Such characteristics are particularly advantageous in movements requiring rapid force development.

Investigations involving powerlifters have reported higher body mass and pronounced muscular circumferences, reflecting the demands of maximal strength and postural stability inherent in powerlifting events (Keogh et al., 2006). Comparative analyses further indicate that anthropometric profiles differ between strength disciplines due to variations in technical execution and biomechanical requirements (Marković & Sekulić, 2006).

Although anthropometric profiling has been widely applied for performance evaluation and talent identification, much of the available literature has focused on male athletes or elite populations. Limited attention has been directed toward comparative studies involving women strength athletes at the university level, particularly within the Indian context. This limitation in existing research provided the basis for the present investigation.

RATIONALE OF THE STUDY

Anthropometric characteristics were recognized as important determinants of performance in strength-based sports such as weightlifting and powerlifting. Although both sports require high levels of muscular strength, they differ in technical execution and biomechanical demands, which may result in distinct body composition profiles. In the Indian university sports context, particularly among women athletes, limited scientific evidence was available comparing the anthropometric characteristics of weightlifters and powerlifters. Therefore, the present study was undertaken to provide objective anthropometric data on inter-collegiate women weightlifters and powerlifters of Mangalore University. The findings were expected to assist coaches and sports scientists in talent identification, training planning, and performance evaluation.

OBJECTIVES OF THE STUDY

1.   To examine selected anthropometric characteristics of inter-collegiate women weightlifters of Mangalore University.
2.   To examine selected anthropometric characteristics sjf inter-collegiate women powerlifters of Mangalore University.
3.   To compare selected anthropometric variables between women weightlifters and powerlifters of Mangalore University.

HYPOTHESES

1.   There was no significant difference in standing height between women weightlifters and powerlifters of Mangalore University.
2.   There was a significant difference in selected anthropometric measurements between women weightlifters and powerlifters of Mangalore University.
3.   Women weightlifters were found to possess better limb lengths and muscular circumferences when compared to women powerlifters of Mangalore University.

METHODOLOGY

Research Design

The present study adopted a descriptive comparative research design to compare selected anthropometric characteristics of women weightlifters and powerlifters.

Sample Selection

A total of sixty (N = 60) inter-collegiate women athletes representing Mangalore University were selected through purposive sampling technique.

- Weightlifters: 30
- Powerlifters: 30

All subjects had represented the university in inter-collegiate competitions and were actively involved in regular training.

Variables of the Study

- **Independent Variable:**

Type of sport (Weightlifting / Powerlifting)

- **Dependent Variables:**

Selected anthropometric measurements

Table 1: Variables and Criteria of Measurement

Sl. No.	Variables	Unit of Measurement	Instrument Used
1	Standing Height	Centimeters (cm)	Stadiometer
2	Body Weight	Kilograms (kg)	Weighing Scale
3	Arm Length	Centimeters (cm)	Measuring Tape
4	Upper Arm Length	Centimeters (cm)	Measuring Tape
5	Lower Arm Length	Centimeters (cm)	Measuring Tape
6	Chest Circumference	Centimeters (cm)	Measuring Tape
7	Thigh Circumference	Centimeters (cm)	Measuring Tape
8	Calf Circumference	Centimeters (cm)	Measuring Tape
9	Thigh Skinfold	Millimeters (mm)	Skinfold Caliper
10	Calf Skinfold	Millimeters (mm)	Skinfold Caliper
11	Waist Skinfold	Millimeters (mm)	Skinfold Caliper

Tools for Data Collection

The following standardized tools were used for data collection:

- Stadiometer
- Digital weighing scale
- Non-elastic measuring tape
- Skinfold caliper

Procedure of Data Collection

Before initiating the data collection process, formal approval was secured from the appropriate institutional authorities. All participants were briefed regarding the objectives of the investigation and the procedures involved prior to

assessment. Anthropometric evaluations were conducted under standardized and supervised conditions to ensure accuracy. To maintain consistency across measurements, observations were obtained from a single side of the body. Each variable was measured more than once, and the most consistent value was considered for statistical analysis.

Criteria of Measurement

- **Height:** Measured with the subject standing erect without footwear.
- **Weight:** Measured with minimal clothing using a calibrated weighing scale.
- **Circumference Measurements:** Taken at standardized anatomical landmarks using a non-elastic tape.
- **Skinfold Measurements:** Measured at specific sites using a skinfold caliper with precision up to 0.5 mm.

Statistical Technique

The collected data were analyzed using:

- Mean
- Standard Deviation
- Independent sample *t*-test

The level of significance was set at **0.05**.

RESULTS AND INTERPRETATION

Table 1 Comparison of Selected Anthropometric Variables between Women Weightlifters and Powerlifters

Sl. No.	Variable	Group	N	Mean	*t*-value	Significance
1	Height (cm)	Weightlifters	30	159	0.444	NS
		Powerlifters	30	156		
2	Body Weight (kg)	Weightlifters	30	65	4.240	*
		Powerlifters	30	62		
3	Arm Length (cm)	Weightlifters	30	27	5.427	*
		Powerlifters	30	23		
4	Upper Arm Length (cm)	Weightlifters	30	16	2.929	*
		Powerlifters	30	13		
5	Lower Arm Length (cm)	Weightlifters	30	30	0.932	NS
		Powerlifters	30	10		
6	Chest Circumference (cm)	Weightlifters	30	34	12.345	*
		Powerlifters	30	33		
7	Calf Circumference (cm)	Weightlifters	30	17.6	2.51	*
		Powerlifters	30	14.4		
8	Thigh Circumference (cm)	Weightlifters	30	13.80	9.09	*
		Powerlifters	30	25.96		
9	Thigh Skinfold (mm)	Weightlifters	30	19.13	1.63	NS
		Powerlifters	30	21.90		
10	Calf Skinfold (mm)	Weightlifters	30	23.36	0.820	NS
		Powerlifters	30	23.80		
11	Waist Skinfold (mm)	Weightlifters	30	32.91	3.149	*
		Powerlifters	30	30.80		

Table 1 presents the comparison of selected anthropometric variables between inter-collegiate women weightlifters and powerlifters of Mangalore University. The results showed no significant difference in standing height between weightlifters (159 cm) and powerlifters (156 cm; $t = 0.444$), indicating similar stature. Body weight was significantly higher among weightlifters (65 kg) compared to powerlifters (62 kg; $t = 4.240$).

Significant differences were observed in arm length (27 cm vs. 23 cm; $t = 5.427$) and upper arm length (16 cm vs. 13 cm; $t = 2.929$), reflecting structural advantages associated with Olympic lifting techniques that require greater leverage

and range of motion. Muscular girths also differed significantly, with higher values for weightlifters in chest circumference (34 cm vs. 33 cm; $t = 12.345$), calf circumference (17.6 cm vs. 14.4 cm; $t = 2.51$), and thigh circumference ($t = 9.09$), indicating superior muscular development.

In contrast, lower arm length ($t = 0.932$), thigh skinfold ($t = 1.63$), and calf skinfold ($t = 0.820$) showed no significant differences between the groups. However, waist skinfold thickness was significantly higher in weightlifters (32.91 mm) than powerlifters (30.80 mm; $t = 3.149$), suggesting variation in central fat distribution.

DISCUSSION

The findings of the present study demonstrated that participation in different strength sports was associated with distinct anthropometric characteristics among inter-collegiate women athletes. The absence of a significant difference in standing height suggests that stature alone does not determine specialization in weightlifting or powerlifting, which is consistent with earlier reports emphasizing the greater influence of body composition and limb dimensions over height (Marković & Sekulić, 2006; Luo et al., 2009).

Significant differences in body weight, limb lengths, muscular circumferences, and waist skinfold thickness were observed, favoring women weightlifters. These variations may be attributed to the repeated exposure to explosive lifting tasks that require enhanced leverage, joint mobility, and coordinated force application (Garhammer, 1993; Ciroslan et al., 2006). Similar relationships between limb dimensions, lean body mass, and lifting performance have been reported by Marefat Siahkouhian et al. (2010, 2016).

The lack of significant differences in lower arm length and selected skinfold measurements suggests comparable segment proportions and peripheral fat distribution between the two groups. Comparable findings have been reported in studies examining trained athletic populations, where not all anthropometric or fat-related variables differed significantly across sport disciplines (Bogin & Vean, 1981; Bandyopadhyay & Chattopadhyay, 1981).

Overall, the findings support the hypothesis that women weightlifters possess more favorable anthropometric characteristics related to muscularity and leverage compared to powerlifters, reinforcing the value of anthropometric profiling in sport-specific training and performance assessment.

CONCLUSION

The present investigation confirmed that inter-collegiate women weightlifters and powerlifters of Mangalore University differed in several selected anthropometric characteristics. While standing height was comparable between the groups, significant differences were observed in body weight, limb dimensions, muscular circumferences, and waist skinfold thickness.

Women weightlifters exhibited anthropometric profiles that may provide functional advantages for explosive lifting movements requiring greater leverage and coordinated force production (Garhammer, 1993; Ciroslan et al., 2006). These findings highlight the relevance of systematic anthropometric assessment for talent identification, individualized training design, and long-term athlete development in women strength sports.

RECOMMENDATIONS

Based on the findings of the present study, the following recommendations were drawn:

1.   Anthropometric profiling should be incorporated into the selection and talent identification process for women weightlifters and powerlifters at the university level, as significant differences were observed in several structural and body composition variables.
2.   Training programs for women weightlifters should emphasize the development of muscular girths and leverage-related characteristics, which were found to be more prominent among weightlifters.

3. Powerlifting training should focus on optimizing maximal strength and stability while maintaining appropriate body composition, as several anthropometric variables showed no significant differences between the two groups.

4. Regular monitoring of anthropometric variables such as circumferences and skinfold thickness is recommended to evaluate training adaptations and control body fat levels.

5. Sports authorities and university administrations should provide adequate training facilities, nutritional guidance, and scientific support to enhance performance and long-term development of women strength athletes.

6. Further research is recommended using larger samples and additional physiological and biomechanical variables to gain a comprehensive understanding of sport-specific adaptations.

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