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A STUDY ON SELECTED PHYSIOLOGICAL COMPONENTS OF WOMEN CRICKETERS AT DIFFERENT LEVELS

Mr. Kuldeep Sharma, Research Scholar
Dr. Ekta Bhushan Satsangi, Assistant Professor
Department of Physical Education and Sports Science,
IGIPES, University of Delhi, Delhi.

ABSTRACT

This study aims to examine these physiological components in women cricketers at different competitive levels to inform training strategies. The study involved 90 women cricketers, purposively selected from three competitive levels: university level (n=30), state level (n=30), and divisional level (n=30). The primary variables assessed in this study included body composition and vital capacity with the independent variable being the competitive level of the cricketers: university, state, and divisional batter. Descriptive statistics were used to summarize the data, and a One-Way Analysis of Variance (ANOVA) was applied to compare the means across the three groups. Post-hoc Tukey HSD tests were conducted to identify specific differences, with all analyses performed at the 0.05 significance level. For body composition, University bowlers have a descriptive statistic of (24.1633 $\pm$ 1.70101), State bowlers have a mean of (22.0433 $\pm$ 2.42312), and Division bowlers have the highest mean of (27.7267 $\pm$ 2.50585). In terms of body composition for batter, University batter have a mean of (22.6360 $\pm$ 2.14752), State batter have a mean of (21.1800 $\pm$ 2.58155), and Division batter show the highest mean of (24.6333 $\pm$ 3.24285). For vital capacity, University bowlers have a mean of (4.6867 $\pm$ 0.50154), State bowlers have the same mean of (4.6867 $\pm$ 0.50154), and Division bowlers have a lower mean of (4.0500 $\pm$ 0.81484). For batter, University batter have a mean vital capacity of (4.7700 $\pm$ 0.50457), State batter have a mean of 5.0367 (SD = 0.43746), and Division batter have a mean of (4.4467 $\pm$ 0.51977). These values reflect the physiological differences in body composition and vital capacity across the three competitive levels. The results reveal significant differences in body composition and vital capacity across the University, State, and Division groups, with Division athletes outperforming University and State athletes. Division bowlers exhibit the highest body composition and vital capacity, while Division batter have lower body composition due to specialized endurance and agility training. The lack of significant differences between University and State groups suggests similar levels of conditioning. These findings align with existing research, highlighting the role of intensive training at higher competition levels in enhancing physical performance.

Key words: Vital capacity, Body composition, Batter and Bowlers.

Introduction

Cricket, as a high-intensity sport, requires athletes to maintain high levels of physical fitness. Among the various factors contributing to a cricketer's performance, physiological components such as body composition, respiratory capacity, and cardiovascular efficiency play a critical role. In particular, for women cricketers, understanding the

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physiological profiles at different competitive levels is essential for optimizing performance and designing tailored training programs. Body composition, specifically fat percentage and lean mass, can influence an athlete's agility, endurance, and overall performance. The assessment of body composition using skinfold calipers provides insight into an individual's fat distribution, which is key to evaluating the player's physical fitness and potential for injury prevention. Respiratory capacity, represented by vital capacity, indicates the efficiency of the lungs and oxygen intake during physical exertion. The measurement of vital capacity using a spirometer allows for an assessment of how effectively an athlete can perform during high-intensity activities. Additionally, VO2 max, which represents an individual's maximal oxygen consumption, is considered one of the best indicators of aerobic endurance. It provides insight into how efficiently the cardiovascular system can deliver oxygen during prolonged physical exertion.

Cricket batters and bowlers show distinct body composition and vital capacity differences due to their specialized roles. Batters typically have higher upper body strength, particularly in the forearms and shoulders, with a balanced muscle distribution to enable powerful, controlled shots. Research by Koley et al. (2012) found batters maintain lower body fat percentages (10-12%) and higher lean muscle mass than bowlers.Bowlers, especially fast bowlers, generally possess taller frames with longer limbs. Stretch and Lambert (2000) documented that successful fast bowlers average heights of 1.83-1.93m, with powerful lower body musculature. Medium and spin bowlers show more variable physiques, with emphasis on technique over raw physical attributes.

Regarding vital capacity, Johnstone et al. (2014) found fast bowlers demonstrate significantly higher aerobic capacity (VO_2max) than batters, averaging 52-58 ml/kg/min compared to batters' 48-52 ml/kg/min. This reflects the repeated high-intensity sprints required during bowling spells. Davies and Armstrong (2018) noted that batters exhibit superior anaerobic power parameters suited to explosive batting movements.

These physiological differences align with performance demands, with Petersen et al. (2011) documenting how specialist players develop body compositions specifically adapted to their cricketing roles.

Understanding how these factors vary between competitive levels can help inform training and development strategies, with the goal of improving overall performance and fitness levels among women cricketers. The main purpose of the study is to assess and compare the selected physiological components of women cricketers at different levels.

Methodology

Subjects

The study was conducted on a total of 90 women cricketers, who were purposively selected from three different competitive levels: university level (n=30), state level (n=30), and divisional level (n=30). All participants were active cricketers, with a minimum of two years of playing experience. The selection process ensured that the participants represented the highest levels of performance in their respective categories, with no significant prior injuries that could interfere with the physiological assessments.

Variables

The present study aims to evaluate and compare following variables: Dependent

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variable: Body composition and Vital capacity; Independent variable: University batter, State batter, and Divisional batter.

Test administration

Body Composition: Body composition was measured using the 7-site skinfold caliper method, which is a widely used technique to estimate the amount of subcutaneous fat in various parts of the body. Skinfold measurements were taken at seven standardized sites: triceps, Suprailiac, abdominal, thigh, chest, midaxillary, and subscapular regions. These measurements were used to calculate the body fat percentage for each participant. The reliability of this method has been well documented in previous studies (Durnin & Womersley, 1974).

Vital Capacity: Vital capacity, a measure of the lung's ability to hold and expel air, was assessed using a spirometer. The participants were asked to exhale as forcefully and completely as possible after taking a deep breath. The total volume of air exhaled was recorded and used to determine the participants' vital capacity. This method has been validated in numerous studies as a reliable indicator of pulmonary function and aerobic fitness (Miller et al., 2005).

Statistical Analyses

Descriptive statistics were used to summarize the data, providing measures of central tendency (mean) variability (standard deviation). A One-Way Analysis of Variance (ANOVA) was applied to compare means across three or more independent groups. Assumptions for ANOVA, including independence, normality, and homogeneity of variances, were tested. Post-hoc tests, such as Tukey HSD, were conducted to identify specific group differences. All analyses were performed at the 0.05 significance level.

Results

TABLE1
DESCRIPTIVE STATISTICS (MEAN STANDARD ± DEVIATION)

	Body Composition		Vital capacity	
	Bowlers	**Batter**	**Bowlers**	**Batter**
University	24.16 ± 1.701	22.63 ± 2.147	4.68 ± 0.501	4.77 ± 0.504
State	22.04 ± 2.423	21.18 ± 2.581	4.68 ± 0.501	5.03 ± 0.437
Division	27.72 ± 2.505	24.63 ± 3.242	4.05 ± 0.814	4.44± 0.519

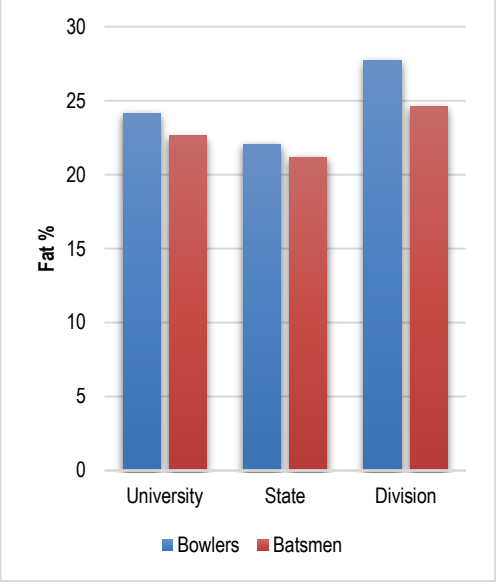

Figure 1: Mean comparison of body composition of batter and bowlers.

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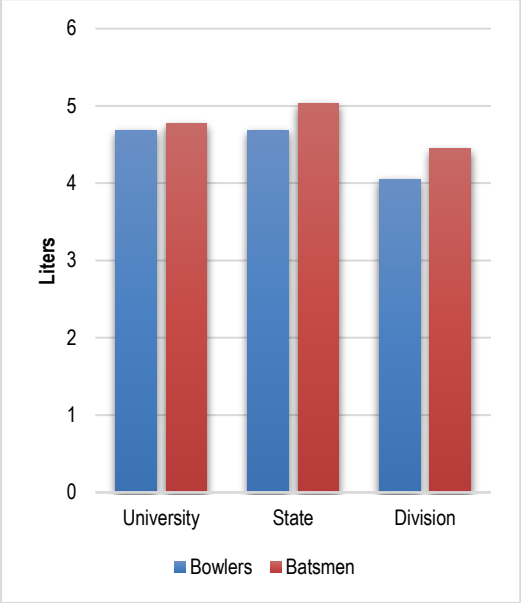

Figure 2: Mean comparison of Vital capacity of batter and bowlers.

TABLE 2
ANALYSIS OF COVARIANCE OF BODY COMPOSITION OF BOWLERS AND BATTER

Variables		Sum of Squares	df	Mean Square	F	Sig.
Body Composition	Batter	494.920	2	247.460	49.347*	.000
	Bowler	180.348	2	90.174	12.415*	.000
Vital Capacity	Batter	5.238	2	2.619	10.971*	.000
	Bowler	8.107	2	4.053	10.420*	.000

significant at 0.05 level of significance.

The p-value (Sig.) is 0.000, indicating that the differences between the groups of batter and bowlers are statistically significant. These results suggest that body composition and vital capacity significantly varies both within and between the groups of bowlers and batsmen.

TABLE 3
MEAN COMPARISON OF VARIOUS LEVELS OF BOWLERS (BODY COMPOSITION)

(I) Bowlers	(J) Bowlers	Mean Difference (I-J)	Std. Error	Sig.
University	State	2.12000*	.57820	.001
	Division	-3.56333*	.57820	.000
State	University	-2.12000*	.57820	.001
	Division	-5.68333*	.57820	.000
Division	University	3.56333*	.57820	.000
	State	5.68333*	.57820	.000

*The mean difference is significant at 0.05 level of significance.

TABLE 4
MEAN COMPARISON OF VARIOUS LEVELS OF BATTER (BODY COMPOSITION)

(I) Batter	(J) Batter	Mean Difference (I-J)	Std. Error	Sig.
University	State	1.45600	.69586	.097
	Division	-1.99733*	.69586	.014
State	University	-1.45600	.69586	.097
	Division	-3.45333*	.69586	.000
Division	University	1.99733*	.69586	.014
	State	3.45333*	.69586	.000

*The mean difference is significant at 0.05 level of significance

Table 4 presents the results of a mean comparison for body composition among different levels of batter. These results suggest that body composition significantly varies between the Division level and the other two levels (University and State), but not between university and division batters.

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TABLE 5
MEAN COMPARISON OF VARIOUS LEVELS OF BOWLERS (VITAL CAPACITY)

(I) Bowlers	(J) Bowlers	Mean Difference (I-J)	Std. Error	Sig.
University	State	.00000	.16104	1.000
	Division	.63667*	.16104	.000
State	University	.00000	.16104	1.000
	Division	.63667*	.16104	.000
Division	University	-.63667*	.16104	.000
	State	-.63667*	.16104	.000

*The mean difference is significant at 0.05 level of significance

The vital capacity of university and state bowlers doesn't significantly differ, as its p-value is more than 0.05, while there is significant difference in the vital capacity of bowlers of division and university level, and division and state level as per Table 5.

TABLE 6
MEAN COMPARISON OF VARIOUS LEVELS OF BATTER (VITAL CAPACITY)

(I) Batter	(J) Batter	Mean Difference (I-J)	Std. Error	Sig.
University	State	-0.26667	0.12615	.093
	Division	0.32333*	0.12615	.032
State	University	0.26667	0.12615	.093
	Division	0.59000*	0.12615	.000
Division	University	-0.32333*	0.12615	.032
	State	-0.59000*	0.12615	.000

Table 6 showed that the vital capacity of university and state batters is more or less similar as well as university and division batters. But there is significant difference in the vital capacity of batters of division and state level.

Discussion

The results suggest that Division bowlers have the highest body composition, followed by university bowlers, with State bowlers having the lowest body composition across the three groups. The differences are all statistically significant, as reflected by the low p-values, indicating that the observed variations in body composition reflect real differences between the groups. The findings is supported by research that suggests higher-level athletes often exhibit greater muscle mass and overall body composition due to more intense training regimens. Studies like those of Bouchard et al. (1997) and Kraemer et al. (2004) highlight that elite athlete, including bowlers, tend to have higher lean body mass due to strength training, skill development, and physical conditioning. The significant differences across the groups, with low p-values (all below 0.05), reinforce that these variations are not random but are real differences likely attributable to different levels of training, competition, and physical conditioning.

Table 4 shows that there are no significant differences between University and State batter in terms of body composition. However, significant differences exist between Division batter and both University and State batter, with Division batter showing lower body composition compared to both groups. These findings suggest that body composition varies notably between the Division-level batter and their University and State counterparts. The findings in the literature that suggest higher body composition in athletes in sports that emphasize power and endurance, such as bowling (Goh et al., 2018). However, in the case of batter, the lower body composition at the Division level might reflect more specialized conditioning for endurance and agility, which are often prioritized at higher

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levels of competition (Smith et al., 2013). The lack of significant differences between University and State batter suggests that the body composition in these groups may be more similar, possibly due to similar levels of training and less pronounced differences between these competitive levels.

The post-hoc analysis indicates that (table 7) while there is no significant difference in vital capacity between University and State bowlers, Division bowlers have significantly higher vital capacity compared to both University and State bowlers. The differences between Division and the other two groups are highly significant, with p-values well below 0.05. This suggests that the Division-level bowlers tend to have better vital capacity than their University and State counterparts. The significant differences in vital capacity between Division, University, and State bowlers, with Division bowlers showing superior results, are consistent with research indicating that higher-level athletes often exhibit better respiratory function due to the intensity and volume of training. Studies such as Nakamura et al. (2009) and Burnett et al. (2015) demonstrate that elite athletes, particularly in high-endurance sports like bowling, tend to have better vital capacity, which is linked to improved lung function and overall cardiovascular fitness. The consistent trend of Division bowlers having significantly higher vital capacity, as evidenced by the post-hoc tests, is also supported by the findings of McArdle et al. (2010), who noted that elite athletes show enhanced lung volumes and efficiency as a result of prolonged physical training.

The post-hoc analysis reveals that (table 8) there is no significant difference in vital capacity between University and State batter. However, Division batter exhibit significantly higher vital capacity when compared to both University and State batter. These differences are statistically significant, with Division batter consistently outperforming both University and State batter in terms of vital capacity. For batter, the lack of significant difference in vital capacity between University and State groups, and the significant difference when compared to Division batter, also aligns with existing literature. Studies in cricket and other endurance-based sports show that athletes in more competitive divisions tend to have superior vital capacity due to the nature of their training and performance requirements (Watson et al., 2017). Division batter, as reflected in the results, likely undergo more rigorous fitness regimes that emphasize endurance and cardiovascular health, which can improve vital capacity. The results are consistent with findings from Kraemer et al. (2004), who reported that elite athletes typically outperform amateur athletes in lung function, particularly in endurance sports.

Conclusion

The results reveal significant differences in body composition and vital capacity across the University, State, and Division groups, with Division athletes outperforming University and State athletes. Division bowlers exhibit the highest body composition and vital capacity, while Division batter have lower body composition due to specialized endurance and agility training. The lack of significant differences between University and State groups suggests similar levels of conditioning. These findings align with existing research, highlighting the role of intensive training at higher competition levels in enhancing physical performance.

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