

Analysing the Association of Explosive Power with Speed and Agility in University Basketball Players

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Abstract The study aims to analyse the association of explosive power, speed, and agility in University Basketball players. Anthropometric data and fitness tests' performance data of the basketball players were used to find the performance disparities between male and female players as well as different player positions. Thirty-six (18 Male and 18 Female) University level basketball players from Guard, center and forward playing positions (n = 6 in each position and gender) have voluntarily taken part in this study (mean age respectively, male: 20.78 ± 1.48 years, female: 20.72 ± 1.45 years). Mean and Standard deviation for age, weight, height, BMI, body fat %, muscle mass, bone mass, 20m sprint time, vertical jump height, and agility tests were used to determine separately for male, female, and all players combined. It was found that men are heavier (72.16 ± 9.66 kgs) and taller (176.89 ± 1.48 cm) than females (59.71 ± 8.08 kgs, 162.44 ± 4.96 cm). Men also had greater muscle mass and bone mass. Conversely, females had greater body fat and BMI. The center and forward players were taller and heavier than the guards. Pearson Correlation Analysis was used to analyse the significance and degree of association of the performance variables. Significant negative correlation (p < 0.01 and p < 0.05) was observed for male and female athletes between explosive power with speed (r = -0.671, r = -0.754) and agility (r = -0.756, r = -0.505) respectively. Whereas, a significant positive correlation (p < 0.01) was found between speed (r = 0.718, r = 0.659) and agility.

Keywords Basketball, Guard, Center, Forward, Anthropometry, Correlation, Speed, Agility, Explosive power

1. Introduction

A team game like basketball involves players to react and adjust quickly to changing game conditions. Quick decision-making and effective implementation of technical and tactical elements determine the outcome of the game. McInnes, 1995 stated that all the explosive jumps and sprinting in the game shows the importance of Anaerobic capacity [25]. A study stated the success factors involved in basketball through studies and found that change of direction, suicide time run, vertical jump, sprint speed and muscle endurance [19] [26]. Previous study also highlighted the important factors of success in basketball, explosive strength, and power of take-off, agility and speed along with the skills that are required to be exceptional in the game with or without the ball. Also, assessment of the ability of these skills and factors are essential and is used to assess the motor potential of athletes [16] with or without the ball [7].

These Motor tests are often used to assess as they are similar to competition or training situations [16]. Explosive power is defined as the capability to make very fast and powerful moves within the shortest time period which an athlete requires to shoot, bound or jump in a game. Vertical jump test (CMJ) using a vertec is used to assess explosive power. The countermovement jump test is used to assess vertical displacement during the lower body explosive jump in athletes [27]. CMJ with arm swing is performed which mimics the similar movement during the game play.

Speed in basketball is how quick the athletes run for fast breaks, taking layups and other transitions between the courts during the game. Sprint speed is assessed by 20-m sprint. 20-m sprint test is used for measuring the initial acceleration of the athlete [8]. Agility is defined as the capability to quickly stop, change movement and directions during the game. The players should maintain stability; dodge through defenders without losing their momentum or control. T-test is used for assessing agility [19].

The players in basketball are categorized based on position of play i.e. Guard (point guard and shooting guard),

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Received: May 12, 2025; Accepted: Jun. 23, 2025; Published: Jul. 25, 2025

Published online at <http://journal.sapub.org/sports>

Forward (small forward and power forward) and centers. The game involves sudden and rapid movements like change of direction, which is affected by the change of posture during the dribbling of the ball. These actions are performed in high frequency of dribbling, stops and physical contact with players which are there in the game rules. Therefore, analysing the performance variables between these three different player positions is necessary to understand the attributes of the players in each position. To fulfil basketball objectives and execution, the intended implementation during a match, each position on the team must have distinct motor requirements and qualities as well as specific motor skills, technical mastery and tactical proficiency [23].

Explosive power, speed, and agility are fundamental attributes that significantly influence athletic performance across various sports. While previous studies have extensively examined the relationships among these variables, they have primarily focused on general athletic populations without considering positional differences [10] [29]. However, emerging research suggests that playing position significantly influences physical demands, movement patterns, and physiological adaptations, necessitating a more targeted approach to training and performance optimization [18] [32].

Athletes in different playing positions exhibit distinct movement profiles, energy system utilization, and skill requirements, which directly impact their training needs and performance outcomes [15]. Defenders often prioritize agility and reaction time to quickly adjust to offensive plays and maintain stability during defensive maneuvers. Midfielders require a balance of explosive power and endurance, as they cover extensive distances while frequently engaging in short bursts of acceleration. Forwards rely heavily on explosive power and sprinting ability to create scoring opportunities and evade defenders [9].

Despite these well-recognized differences in positional demands, limited research has systematically analysed how explosive power, speed, and agility interact across different playing roles. Our study aims to bridge this gap by providing empirical evidence on position-specific athletic attributes, which can be instrumental in developing tailored training interventions that optimize performance efficiency and reduce injury risks.

2. Review of Literature

Basketball is a diverse and sophisticated game in which team members must respond quickly and adapt to ever changing game conditions. The game's success is defined by making sound and timely decisions and carrying out complex and strategic components accurately and effectively. Researchers have analysed the connections between different motor skills that are lacking despite the attention that sports scientists and professionals devote to performance evaluation [46]. One of the most important factors to determine a basketball player's position is their height and

weight [14]. Moreover, an athlete's physical composition has a major role in determining their capacity to perform at the highest level in sports [11] [35]. Based on the examination of specific individual positions in the game, Abdelkrim et al, stated that forwards are significantly taller and heavier than guards, while centers are significantly taller and heavier than forwards [4]. Also, research on senior basketball players, showed that forwards and centers were taller than guards and centers were much heavier than guards and centers [22] [39].

A moderate relationship was found between the anaerobic variables (Explosive power, speed and agility) where $r = -0.61$ and 0.60 respectively [3]. A study by a group of researchers in 2012 showed a strong negative correlation between explosive power and sprint performance in basketball players ($r = -0.74$) [42]. They showed that counter movement jump was a predictor of RSA (Repeated sprint ability) as when athletes with better jump performance complete RSA quicker and vice versa. A research study by Chouachi et al, showed significant correlation of T-test with body mass ($r = 0.58$), body fat ($r = 0.80$) and 5-jump test ($r = -0.61$). It also stated that the squat jump test was a great predictor of 5 and 10 m sprints [12].

Basketball players are expected to develop these attributes based on their predicted playing positions on the court, which include guard, forward, and center. These positions have varied skill and physiological demands [19] [31]. Guards cover more ground in a game than centers and forwards, while forwards cover a lot more ground than centers [44]. Players need to possess ideally developed explosive power, agility, speed, anaerobic power, and anaerobic capacity in order to perform at their best [13] [38], centers' poor performance was driven by their larger stature and weight, and that made it harder for them to perform high-intensity exercises.

There is a lack of information regarding the effects of various factors, including athletes' age, body composition and training status, on performance outcomes in university level basketball players. There are insufficient analyses done according to player positions and the relationship between the positions. Therefore, the purpose of this study was to investigate the relationship between sprinting ability with agility and vertical jump performance in university basketball players.

3. Methods

Experimental Design

This study aims to investigate the relationship between speed and agility with explosive power in university basketball players. The study has examined the relationship between the vertical jump performance with speed and vertical jump performance with agility. The relationship between the vertical jump performance, speed and agility amongst various player positions (guard, center and forward) were analysed. Performance disparities between male and female basketball players were compared.

Research design and strategy

This Cross-sectional study was conducted in Sri Ramachandra Centre for Sports Science, Porur, Chennai, India for 12 weeks. The sample size was calculated prior to the initiation of the study by using a prior error significance $\alpha = 0.05$, confidence interval = 90%, power $\beta = 0.90$ and previous correlation coefficient hypothesis = -0.619. So, a sample size 36 basketball players (male players $n = 18$, female players $n = 18$) was required for this study.

Procedures

The subjects were approached and a consent form was provided. The participants were asked for basic details and had to sign the consent form. The subjects were categorized based on the position of play in the sport of Basketball

i.e. Guard (point guard and shooting guard), Forward (small forward and power forward), and centers. In the first stage, subjects performed a warm-up which comprised of running and dynamic stretching. In the later stage, Data was collected for the following tests – Anthropometry - Height, Weight., Tanita (BMI, Body Fat %, Bone mass, Muscle mass), Vertical jump test (Explosive power), 20m Sprint test (Speed) and T-test (Agility) which were used to calculate the correlation.

Materials Required

- Data collection sheet – Proforma
- Anthropometry – Tanita instrument, stadiometer (Ht.), weighing machine (Wt.)
- Sprint and agility test – stopwatch, cones, measuring tape
- Vertical jump test – Vertec equipment



Figure 1. Vertical jump test (vertec)



Figure 2. Vertical jump test

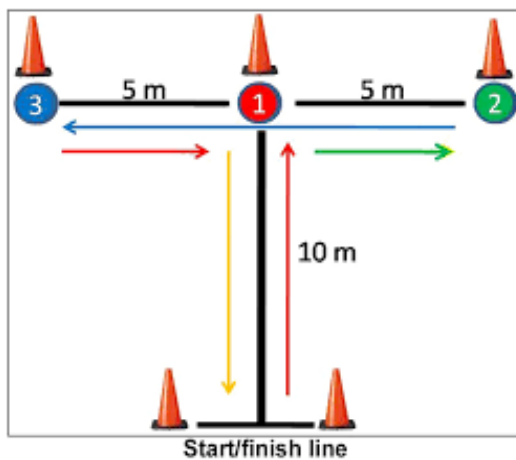


Figure 3. Agility T- test (Arazi et al., 2014)



Figure 4. Agility start position

Table 1. Descriptive statistics (mean and SD) for men, women, and the combined group

Variable	Men (n = 18)		Women (n = 18)		Combined	
	Mean	SD	Mean	SD	Mean	SD
1. Age (years)	20.78	1.48	20.72	1.45	20.75	1.44
2. Height (cms)	176.89	8.05	162.44	4.96	169.67	9.85
3. Weight (kgs)	73.98	13.17	59.75	8.08	66.87	12.96
4. BMI	23.62	3.44	22.72	2.83	23.17	3.14
5. Body Fat (%)	14.97	5.35	27.91	5.36	21.44	8.42
6. Muscle mass (kgs)	58.11	8.53	39.36	3.67	48.73	11.50
7. Bone mass (kgs)	3.26	0.49	2.67	0.34	2.96	0.51
8. 20m sprint (s)	3.24	0.29	3.85	0.29	3.55	0.42
9. Vertical jump height (cms)	65.82	8.78	44.17	7.05	54.99	13.50
10. Agility T-test (s)	10.55	0.85	12.32	0.81	11.44	1.22

Note. SD is used to indicate Standard Deviation, s - seconds, cms - centimeters, kgs – kilograms and % - percentage.

Data Analysis

A Statistical analysis is performed for the association between vertical jump with sprinting ability and agility. The mean \pm standard deviation (descriptive statistics) values for age, height, weight, BMI, body fat percentage, muscle mass, bone mass, 20m sprint time, vertical jump height and agility were calculated separately for male, female and both players combined.

Data analysis for the different player positions was done using Pearson correlation Coefficient. The relationships between jumping ability, agility and sprint performance for male and female players were analysed using the Pearson Correlation. It was done to understand the significance and direction of the specific roles of the players. If there was significance, the trend of evidence (strong, moderate or weak) was concluded by finding the p-value using the R-value (Pearson correlation coefficient). The strength of correlational association is as follows: (1) Values of 0.2-0.39 weak correlation, (2) 0.4-0.59 moderate correlation and (3) 0.6-0.79 are strong correlation (Liang et al., 2019).

Three variables: Explosive power, Speed and Agility.

Three groups: Guards, Forwards and Centers.

4. Results

Descriptive statistics

Data of Mean \pm Standard deviation of age, height, weight, BMI, body fat percentage, muscle mass, bone mass, 20m sprint time, vertical jump height and agility of players is given in Table 1. The descriptive statistics are given for men, women and all the players combined.

All the players were aged 20.75 ± 1.44 yrs. on an average while the male basket ballers were 20.78 ± 1.48 yrs. and female players were aged 20.72 ± 1.45 yrs. The combined heights and weights of the players were 169.67 kg and 66.87 kgs. General BMI and body fat percentage values include 23.17 and 21.44%. The muscle mass and bone mass of the

basket ballers observed were 48.73 kgs and 2.96 kgs. 20-m sprint time, vertical jump height and T-test time values observed were 3.55 ± 0.42 s, 54.99 ± 11.44 cm, 11.44 ± 1.22 s respectively.

Pearson correlation analysis

Table 2 shows the association between jumping ability, agility and sprint performance for male and female players using Pearson correlation. The p-value for all the variable was $p < 0.01$ except the p-value for Explosive vs. Agility in female players was $p < 0.05$.

Table 2. Pearson correlation analysis between Explosive power, speed and agility

Men	Variable	1	2	3
		1. Explosive		-0.671
	2. Speed	-0.671		0.718
	3. Agility	-0.756	0.718	
Women	Variable	1	2	3
	1. Explosive		-0.754	-0.505*
	2. Speed	-0.754		0.659
	3. Agility	-0.505*	0.659	

Note. $p < 0.01$

* $p < 0.05$

Explosive vs. Speed (Figure 5 and 6)

In males, negative correlation -0.671 ($p < 0.01$) was found between explosive power and agility. The females as well have strong evidence in negative correlation -0.754 ($p < 0.01$).

Explosive vs. Agility (Figure 7 and 8)

The male players exhibit a strong negative correlation -0.756 ($p < 0.01$) whereas the female ballers exhibit a moderate negative correlation -0.505 ($p < 0.05$).

Speed vs. Agility (Figure 9 and 10)

Both the male 0.718 ($p < 0.01$) and female players 0.659 ($p < 0.01$) have a positive correlation and strong evidence.

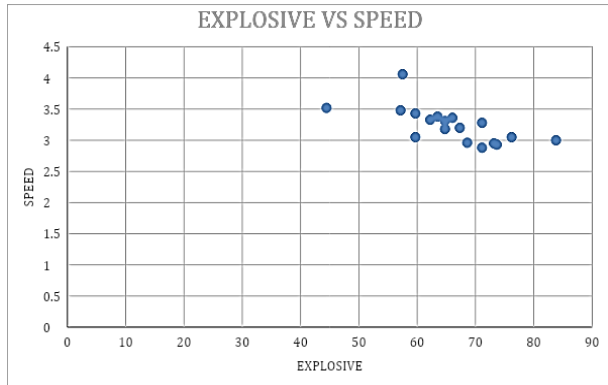


Figure 5. Men – Explosive vs. Speed

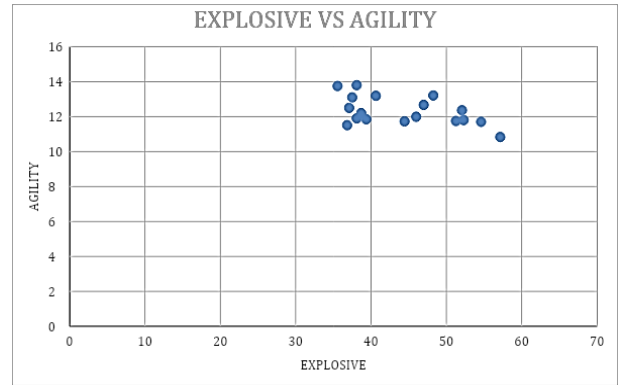


Figure 8. Women – Explosive vs. Agility

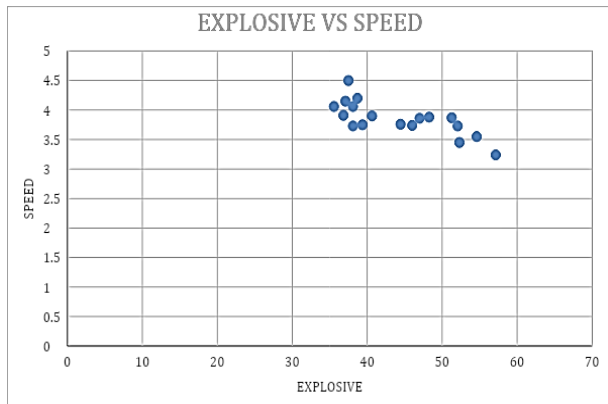


Figure 6. Women – Explosive vs. Speed

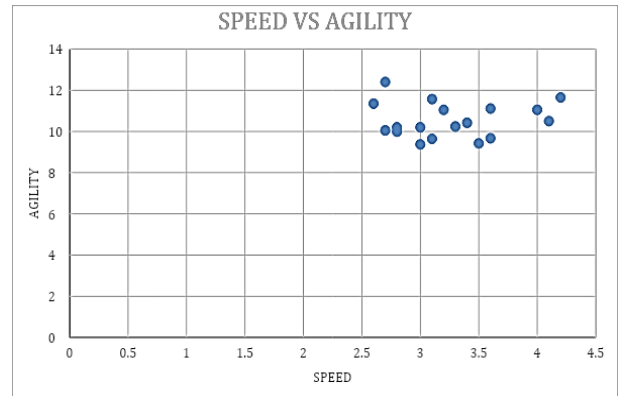


Figure 9. Men – Speed vs. Agility

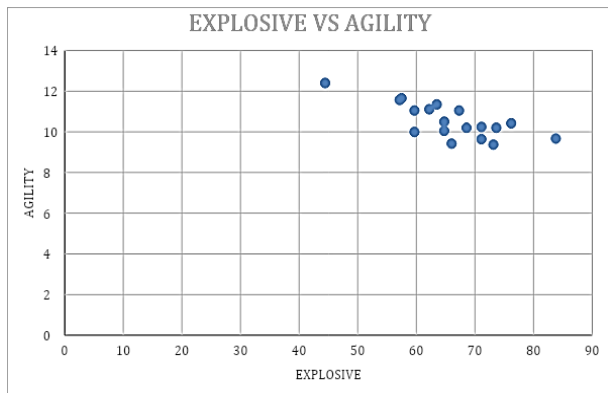


Figure 7. Men – Explosive vs. Agility

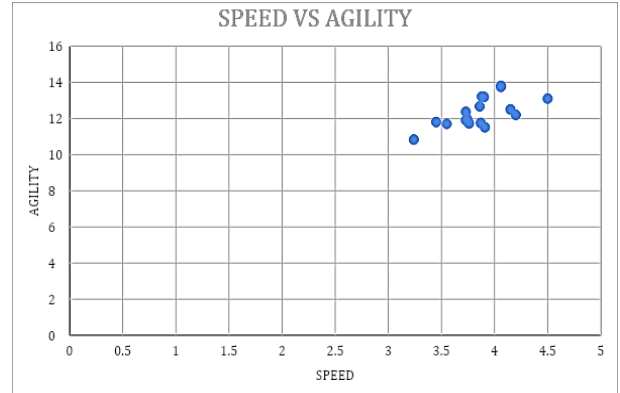


Figure 10. Women – Speed vs. Agility

Table 3. Physical and motorist characteristics according to basketball playing positions

Men	Variable	All players (n=18)		Guards (n=6)		Center (n=6)		Forward (n=6)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
	1. Age (years)	20.78	1.48	21.33	0.82	20.33	1.37	20.67	2.07
	2. Height (cms)	176.89	9.66	174.43	6.55	177.00	10.75	180.50	5.43
	3. Weight (kgs)	72.16	14.45	67.77	11.47	78.97	15.00	75.22	12.46
	4. BMI	23.42	3.27	22.67	3.56	25.15	3.55	23.03	3.26
	5. Body Fat (%)	16.11	6.06	13.38	4.71	18.18	6.09	13.35	4.41
	6. Muscle mass (kgs)	56.07	10.72	55.27	6.74	57.65	10.95	61.40	7.70
	7. Bone mass (kgs)	3.18	0.58	3.02	0.36	3.42	0.65	3.35	0.40
	8. 20m sprint (s)	3.29	0.32	3.17	0.18	3.40	0.39	3.16	0.23
	9. CMJ height (cms)	63.21	10.31	66.59	3.99	61.23	12.94	69.64	5.93
	10. Agility T-test (s)	10.75	1.04	10.52	0.77	10.96	1.07	10.16	0.58

Note. SD is used to indicate Standard Deviation, CMJ – Countermovement jump, s - seconds, cms - centimeters, and kgs - kilograms, % - percentage.

Table 4. Physical and motorist characteristics according to basketball playing positions

Women	Variable	All players (n=18)		Guards (n=6)		Center (n=6)		Forward (n=6)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
	1. Age (years)	20.72	1.45	21.33	1.51	21.17	1.47	19.67	0.82
	2. Height (cms)	162.44	4.96	164.00	2.76	165.00	6.45	158.33	1.86
	3. Weight (kgs)	59.75	8.08	62.82	9.62	59.82	8.35	56.62	6.05
	4. BMI	22.72	2.83	23.38	3.70	22.18	2.59	22.58	2.45
	5. Body Fat (%)	27.91	5.36	29.27	5.85	26.53	5.86	27.93	4.98
	6. Muscle mass (kg)	39.36	3.67	41.25	3.26	38.62	4.90	38.22	2.15
	7. Bone mass (kg)	2.67	0.34	2.85	0.29	2.78	0.30	2.37	0.21
	8. 20m sprint (s)	3.85	0.29	3.89	0.15	3.97	0.38	3.70	0.26
	9. CMJ height (cms)	44.17	7.05	42.88	6.46	43.69	7.09	45.93	8.44
	10. Agility T-test (s)	12.32	0.81	12.73	0.96	12.28	0.50	11.96	0.85

Note. SD is used to indicate Standard Deviation, CMJ – Countermovement jump, s - seconds, cms - centimeters, and kgs - kilograms, % - percentage.

Descriptive statistics mean ± SD of the players’ age, height, weight, BMI, body fat percentage, muscle mass, bone mass, 20m sprint time, vertical jump height and agility based on their positional roles are given for male players (Table 3) and female players (Table 4).

Anthropometric analysis

Anatomical data

For the male players, the mean values for height of the guards, centers and forwards are 174.43 cm, 177 cm and 180.5 cm respectively; on the other hand, the females have 164 cm, 165 cm and 158.33cm respectively. Body weight of the male guards, centers and forwards are 67.77 kg, 78.97 kg and 75.22 kg respectively whilst 62.82 kgs, 59.82 kgs and 56.62 kgs in female players. The average BMI of the male guards was 22.67, centers was 25.15 and the forwards had 23.03. In contrast, the female guards were 23.38, centers with 22.28 and forwards with 22.58.

Body composition

The mean body fat percentages for male basket ballers include 13.38% for guards, 18.18% for the centers and 13.35% for the forwards while the female guards with 29.27%, centers with 26.53% and forwards with 27.94%. Muscle mass and bone mass of the male guards are 55.27 kgs and 3.02kgs respectively, 57.65 kgs and 3.42kgs for the centers, and 61.4 kgs and 3.35 kgs respectively for the forwards. In female players, the muscle mass and bone mass of guards include 41.24 kgs and 2.85 kgs resp., 38.62 kgs and 2.78 kgs resp. for centers and 38.22 kgs and 2.37 kgs resp. for forwards.

Performance variables

Sprint

The 20-m sprint timings for male basket ballers include 3.29 ± 0.32s, 3.17 ± 0.18s, 3.40 ± 0.39s for guards, centers and forwards correspondingly while the female basket ballers have a sprint time of 3.89 ± 0.25s, 3.97 ± 0.38s, 3.7 ± 0.26s correspondingly.

Explosive power

Vertical CMJ height values for male guards, centers and forwards are correspondingly 66.59 ± 3.99cm, 61.23 ± 12.94

cm and 69.64 ± 5.93cm. On the other hand, CMJ height in female players includes 42.88 ± 6.45cm, 43.69 ± 7.09cm and 45.93 ± 8.55cm respectively.

Agility

The mean timings for agility T-test in male guards, centers and forwards was 10.52 ± 0.77s, 10.96 ± 1.07s and 10.16 ± 0.58s as follows. In sequence for the female players 12.73 ± 0.96s, 12.28 ± 0.5s, 11.96 ± 0.85s resp. was observed.

Effect Size Calculations

To calculate Cohen’s d and Eta Squared (η²) using the following formulas:

Cohen’s d Formula:

Cohen's d = (M2 - M1)/SDpooled
 Where: SDpooled = √((SD1² + SD2²)/2)
 Where:

- M1, M2, M_1, M_2 are the means of two groups (Men and Women)
- SD1, SD2, SD_1, SD_2 are the standard deviations of two groups

Eta Squared (η²) Formula:

η²=d²/d²+4

Where d is Cohen’s d.

Effect Size Estimates for Key Variables

Table 5

Variable	Cohen’s d	Eta Squared (η²)	Effect Size Interpretation
Height (cm)	2.02	0.50	Large
Weight (kg)	1.27	0.29	Large
BMI	0.29	0.02	Small
Body Fat (%)	2.41	0.59	Large
Muscle Mass (kg)	2.78	0.66	Large
Bone Mass (kg)	1.36	0.32	Large
20m Sprint (s)	2.10	0.52	Large
Vertical Jump Height (cm)	2.69	0.64	Large
Agility T-Test (s)	2.12	0.53	Large

Effect Size Estimates for Key Variables shows the Large effect sizes are observed for height, weight, body fat, muscle mass, sprint speed, vertical jump, and agility, indicating significant differences between men and women in these variables. BMI shows a small effect size, suggesting minimal difference between genders. Bone mass has a large effect size, reflecting physiological differences in skeletal structure.

5. Discussion

The objective of modern elite basketball is for every player to be physically fit and able to manoeuvre efficiently regardless of what position they have on the court [1]. Nonetheless, the different positions within the squad define the appropriate types of movement required in that particular position as well as significantly higher quantity of technical and tactical components; including pressing the ball forward [45]. The goal of contemporary top basketball is for each player to possess the ability to move effectively irrespective of their position on the team, and to possess a high level of physical fitness [1].

Performance disparities between male and female players

The main motive for the calculation of descriptive statistics was to find the reason behind performance disparities between male and female players. [4] [17] [30] have noted differences in the anatomical and physiological characteristics such as player's height, aerobic capacity and muscular power. Based on the analysis, the male players have significantly higher average values of height and weight (176.89cm and 73.98kg) compared to the female counterparts (162.44cm and 59.75kg). Also, the male players on an average have much higher muscle mass (kgs in bw) than the female players (Male = 58.11kg; Female = 39.36kg). They possess a greater bone mass (3.26kg) in comparison to the female players (32.67kg). The athletes with proper body composition showed better performance and players with greater body fat have performed poorly [33].

Thus, the only contradicting variable in this study is the body fat percentage (BF %) which is notably higher in female players. They exhibit almost 28% of their body weight ($27.91 \pm 5.36\%$) whereas body fat percentage in male players constitutes nearly 15% of their body weight ($14.97 \pm 5.35\%$). When assessing the composition of the body in basketball players. It is quite important to consider the sex of the athlete. There are various factors that limit the performance of the female athletes. Female players exhibit higher body fat levels than the male counterparts [37]. This is due to the evolutionary changes (for example pregnancy) and other physiological changes (greater oestrogen) [21]. On the same note, mean body fat was investigated for male and female basketball players by Sansone, 2022. The study concluded that for males the BF is 13.1% and for females the BF is 20.7% [36].

Differences between player positions

Differences in the anatomical and physiological characteristics such as player's height, aerobic capacity and

muscular power that have been documented complement basketball players in elite and high-level leagues. Very few studies have documented the alterations of body fat in different positions and gender. Also, the variations noted in those few studies have varied conclusions. For example, [4] [30] have mentioned that players in higher level have lower body fat than those in lower level of play, whereas [17] [35] observed no differences in body fat, and [44] had observed higher body fat percentage in the national level players compared to the regional level players.

Analysed the differences in positional roles of Under-18, Under-20 and Senior players. The study concluded that the forwards and centers were taller compared to the guards [4]. There is similar observation in the current study where the forwards ($180.5 \pm 5.43\text{cms}$) and centers ($177 \pm 10.75\text{cms}$) are the tallest players compared to the guards being the shortest ($174.43 \pm 6.55\text{cms}$). [6] observed that the centers were the heaviest and had a higher body fat of $15.2 \pm 4.0\%$. In the current study, centers are the heaviest ($78.97 \pm 15\text{kgs}$) having a BMI of 25.15 whereas the guards weigh the lightest ($67.77 \pm 11.47\text{kgs}$) with a BMI of 22.67 and the forwards in the mid-range ($75.22 \pm 12.46\text{kgs}$) and average BMI 23.03. Centers had a body fat of $18.18 \pm 6.09\%$ whereas the forwards possess body fat percentage of $18.35 \pm 4.41\%$. Parallel findings are seen in a study by [4] where the centers and forwards are heavier than the guards. Another study found that it was hard for the centers to perform high intensity activities as they had higher body weight and a larger body size and had lowered performance [31].

Association between explosive power, speed and agility

In males, negative correlation $-0.671 (p < 0.01)$ was found between explosive power and agility. The females as well have strong evidence in negative correlation $-0.754 (p < 0.01)$. This suggests that the players who are better at explosive power are insufficient in agility performance. This could be due to lack of training of the particular performance variable and other physical attributes. The concluded similar results obtaining moderate correlation ($r = -0.43$) of explosive power with agility [43]. Similarly, [2] determined a moderate correlation between countermovement jump with sprint (-0.61) and agility (-0.59) in male basketball players.

In this study, male players exhibit a strong negative correlation $-0.756 (p < 0.01)$ between explosive and speed, whereas the female ballers exhibit a moderate negative correlation $-0.505 (p < 0.05)$. Many studies concluded negative correlation between explosive power and sprint time in basketball players [2] [40] [42] [43]. For association between speed and agility the male $0.718 (p < 0.01)$ and female players $0.659 (p < 0.01)$ have a positive correlation and strong evidence. [10] [12] concluded no significance between sprint and agility (T-test) whereas a study by [3] observed a moderate correlation between sprint and agility ($r = -0.6$).

Applied implications

Position-specific training methods can be incorporated. This helps in analysing the different technical, tactical and physical demands of each position and can increase the

performance of every player in the team. Developing training programs for both genders can help us create individualized programs. Also addressing negative correlations between the variables can maximize the potential and balance out the weaker variables. Evaluation of more accurate assessments according to positional needs by progressing along with athlete feedback helps in minimizing errors. Comparison of anthropometric data of other University level athletes can be used to promote development amongst athletes and future studies.

6. Conclusions

This study examined the relationships between explosive power, speed, and agility across different playing positions among university level basketball players providing valuable insights into position-specific athletic demands. The findings indicate significant correlations between explosive power, speed, and agility, reinforcing existing literature while highlighting positional differences that may influence performance optimization strategies. This comparison reveals the importance of specific variables according to different positions in the game, the strengths and weaknesses in each position and understanding position-specific training needs.

Explosive power is significantly correlated with agility suggesting that athletes with greater explosive strength tend to exhibit better agility. So players' position in the game must be chosen based on their capabilities and should work on their weaknesses. The comparison between male and female players allows us to come to a conclusion on the differences between physical and motoric characteristics and the reason behind performance decrements in female athletes. Based on the valuable data presented by this study, players, coaches and other professionals at the University level games can compare and evaluate players.

7. Limitation & Future Scopes

This study was conducted as a pilot study within the Indian population, with a limited sample size of 36 participants (18 men and 18 women). While the findings provide valuable preliminary insights, the small sample size reduces statistical power and may limit the generalizability of the results to a broader population. A larger sample would enhance the reliability and applicability of the findings across different demographic groups.

The study primarily relied on simple correlation analysis to examine relationships between explosive power, speed, and agility. More robust statistical methods, such as regression modeling and structural equation modeling (SEM), were not employed. These advanced techniques could help account for confounding variables, establish causal relationships, and provide a more comprehensive understanding of the interactions between key performance indicators.

Factors such as nutrition, and circadian timing were not explicitly controlled, which may introduce variability in the

results. Future studies should incorporate standardized protocols to minimize external influences and improve the accuracy of findings.

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