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A Comparative Study of Skill-Related Physical Fitness Characteristics among District-Level Basketball and Football Players

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ABSTRACT

Background:
Skill-related physical fitness is essential for performance in sports like basketball and football, which require agility, speed, balance, and quick decision-making. Although both sports are physically demanding, their specific fitness needs differ due to game rules and movement patterns.

Objective:
To compare agility, speed, and dynamic balance between district-level basketball and football players.

Methodology:
Sixty male district-level athletes (30 basketball, 30 football) were selected through purposive sampling.

Agility: Illinois Agility Test

Speed: 40-Yard Shuttle Run Test

Balance: Star Excursion Balance Test

Data were analyzed using descriptive statistics and independent t-tests.

Results:
A significant difference was found in agility, with football players outperforming basketball players. However, no significant differences were observed in speed and dynamic balance, indicating similar levels between the two groups.

Conclusion:
Football players showed greater agility, while speed and balance levels were comparable across both sports.

Keywords: Skill-related fitness, Agility, Speed, Balance, Football, Basketball.

1. Introduction

Success in team sports is influenced not only by technical and tactical skills but also by psychological wellbeing, motivation, physical conditioning, and playing style. Physical fitness is often considered the most critical determinant of athletic performance, encompassing components such as strength, speed, agility, and endurance, which collectively shape the execution of complex motor skills required in sports (1).

1.1 Physical Fitness

Physical fitness refers to an individual's ability to perform daily tasks with vigor and alertness, without undue fatigue, and with sufficient energy for leisure activities and unforeseen emergencies (1). It is a multidimensional construct that includes both health-related and skill-related components. Health-related fitness comprises body composition, cardiovascular endurance, muscular strength and endurance, and flexibility, while skill-related fitness includes agility, speed, power, coordination, balance, and reaction time (2).

Athletes across different sports exhibit significant variation in body morphology, fitness levels, and psychological profiles (3). Physical fitness plays a central role in sports training, serving as a foundation for overall athletic development and injury prevention. Among children and adolescents, it is an

important predictor of both current and future health status (4). While conceptual definitions of fitness are well-established, operationalizing attributes like vigor, fatigue, and enjoyment poses challenges in empirical measurement (5).

The relative importance of specific fitness components varies with the sport and playing position. Numerous studies have profiled these physical demands across team-based ball sports, highlighting the sport-specific combination of physical attributes required for optimal performance (6).

1.2 Basketball and Football: Physical Demands and Popularity

Basketball and football are globally popular team sports that require a high degree of physical fitness for successful performance. Both involve continuous movement, tactical execution, and rapid decision-making under pressure.

Basketball players typically exhibit superior upper body strength, flexibility, reaction time, and agility, while football players generally have greater lower body strength and muscular endurance (1,2). Basketball emphasizes vertical jumping, sprinting, and multidirectional movement, requiring strength, agility, flexibility, and coordination. Conversely, football performance depends on speed, power, quickness, agility, reaction time, and endurance, all within a framework of tactical discipline and positional awareness (2,9).

The physical and technical demands of these sports make them ideal for comparative studies, particularly in evaluating skill-related physical fitness attributes such as agility, speed, and dynamic balance.

1.3 Skill-Related Physical Fitness Components

1.3.1 Agility

Agility is the ability to rapidly and accurately change the position of the body in response to a specific stimulus (2). It is a multidimensional quality comprising cognitive, technical, and physical components. In invasion sports like basketball and football, agility plays a crucial role in offensive and defensive maneuvers (10). It is closely associated with muscle strength, coordination, reaction time, speed, and explosive power (11).

Agility involves three stages of information processing: stimulus perception, response selection, and movement execution (12). Sports like soccer, basketball, and tennis require athletes to constantly change direction in response to unpredictable stimuli, making agility a key determinant of performance.

1.3.2 Balance

Balance refers to the ability to maintain the body's center of gravity over its base of support. It is categorized into static and dynamic forms. Static balance involves maintaining a stable position with minimal movement, whereas dynamic balance pertains to maintaining stability during movement or in response to external forces (13,14).

Dynamic balance is essential for most sports and daily activities, contributing significantly to performance and injury prevention (14). It involves integration of visual, vestibular, and somatosensory inputs to maintain postural control. Balance assessments such as the Star Excursion Balance Test (SEBT) have demonstrated high reliability and are widely used to evaluate balance impairments, particularly those associated with chronic ankle instability (15,16).

In sports like football and basketball, both static and dynamic balance are critical for executing sport-specific tasks and avoiding injuries (16).

1.3.3 Speed

Speed is defined as the ability to perform a movement in the shortest possible time (1). It includes various subcomponents such as acceleration, maximum velocity, and change-of-direction speed (17). Speed is essential in multidirectional sports, where athletes must accelerate, decelerate, and change direction rapidly (18,19).

Speed performance is influenced not only by motor abilities like running technique and power but also by psychomotor skills such as perception, anticipation, decision-making, and reaction time (20). High-speed execution enhances the effectiveness of technical and tactical actions, making speed a critical focus in sports training, particularly for young athletes.

1.4 Assessment of Physical Fitness Components

Various tests are employed to assess agility, speed, and balance. Traditional agility tests—such as the Illinois Agility Test (IAT), Shuttle Run, and T-Test—measure pre-planned changes of direction and movement speed. While these tests are reliable, they may not fully capture the reactive component of agility. Newer tests, such as reactive agility assessments, incorporate cognitive elements like anticipation and decision-making based on external stimuli (21).

The IAT is a widely used test that includes multidirectional maneuvers and has demonstrated excellent reliability across sports (8). For balance, static tests like the Flamingo Balance Test offer simplicity and feasibility for mass assessment, while dynamic tests like the SEBT provide more functional evaluation of postural stability (7,8).

Accurate measurement of these components is essential not only for performance optimization but also for injury prevention and rehabilitation.

Purpose of the Study

The primary objective of this study is to compare skill-related physical fitness attributes between district-level basketball and football players. Additionally, it aims to evaluate the implications of these differences for sport-specific training and performance optimization. Finally, the study seeks to establish a basis for future comparative research involving athletes from other sports with similar physical skill requirements.

2. Methodology

2.1 Study Design

The present study adopted a cross-sectional design to facilitate a comparative analysis of skill-related physical fitness attributes between district-level football and basketball players.

2.2 Study Population

The target population comprised male athletes actively participating in district-level football and basketball competitions. These individuals represented a homogenous group in terms of competitive level, thereby enabling a controlled comparison of sport-specific physical fitness characteristics.

2.3 Study Duration

The study was conducted over a period spanning from October 2024 to April 2025, ensuring adequate time for recruitment, data collection, and initial analysis.

2.4 Study Setting

Data collection was undertaken at multiple sports academies and institutional training centers situated within Surat city. These settings were selected based on their infrastructure adequacy, availability of standard testing equipment, and access to district-level athletes. The use of familiar training environments aimed to minimize external variables that could affect performance during testing procedures.

2.5 Sample Size

A total of 60 male athletes were purposively selected for inclusion, consisting of 30 football players and 30 basketball players. All participants were verified to have competed at the district level in their respective sports.

2.6 Inclusion Criteria

To ensure sample uniformity and relevance, participants were included based on the following criteria:

- Male gender
- Age range between 18 and 25 years
- A minimum of three years of documented experience competing at the district level
- A regular training regimen of at least three sessions per week, with each session lasting approximately three hours
- Absence of any diagnosed musculoskeletal, cardiovascular, or neurological conditions that could potentially affect physical performance

2.7 Exclusion Criteria

Participants were excluded if they presented with any current or prior diagnosis of musculoskeletal, cardiovascular, or neurological impairments that could compromise the validity of the physical fitness assessments.

2.8 Data Collection Procedure

Prior to data collection, ethical clearance was obtained from the Institutional Ethical and Scientific Committee of The Sarvajanik College of Physiotherapy. Eligible participants were recruited through coordination with local sports academies and training centers in Surat. Informed consent was secured from all participants in accordance with ethical research standards. Data collection was conducted in field-based settings using standardized test protocols designed to evaluate components of skill-related physical fitness. Testing procedures were administered by trained personnel to ensure consistency, accuracy, and reliability of the measurements.

3. Statistical Analyses

3.1 Descriptive Statistics of Tests

Group	Test	N	Range	Minimum	Maximum	Mean	Standard Deviation
1	IAT Time	30	7.55	17.54	25.09	19.404	1.552
1	STARR	30	22.00	104.58	126.58	114.121	5.261
1	STARL	30	60.93	85.59	146.51	120.468	15.362
1	Shuttle Run	30	3.50	16.15	19.65	17.949	0.959
2	IAT Time	30	3.84	16.09	19.93	17.626	0.995
2	STARR	30	58.92	80.30	139.22	116.165	13.415
2	STARL	30	52.82	105.35	158.17	125.093	11.702
2	Shuttle Run	30	4.93	10.32	15.25	12.046	1.202

The study compared skill-related physical fitness between district-level basketball and football players (30 in each group).

- **Agility (IAT Time):** Football players showed better agility with lower mean times (17.63s) than basketball players (19.40s).
- **Dynamic Balance (STARR & STARL):** Football players had slightly better balance on both right (116.16 cm vs. 114.12 cm) and left sides (125.09 cm vs. 120.47 cm).
- **Speed (Shuttle Run):** Football players performed faster (12.05s) than basketball players (17.95s).

3.2 Independent t-test Results

Test	**t-statistic**	**p-value**	**Degrees of Freedom**	**Interpretation**
IAT Time	5.28	0.0000029	49.37	Significant difference; Football > Basketball
STARR	-0.78	0.44196	37.72	No significant difference
STARL	-1.31	0.19507	54.18	No significant difference
Shuttle Run	21.02	<0.000000001	55.28	Significant difference; Football > Basketball

The independent t-test analysis demonstrated significant differences in agility and speed-related performances between district-level football and basketball players. Specifically, football players exhibited superior results in the Illinois Agility Test (IAT) Time and Shuttle Run tests, indicating enhanced agility and sprint capabilities compared to basketball players. Conversely, there were no statistically significant differences in balance performance, as measured by the Star Excursion Balance Test in the right (STARR) and left (STARL) directions, suggesting similar balance proficiency across both sports disciplines.

4. Results

The study compared skill-related physical fitness attributes—agility, dynamic balance, and speed—between district-level basketball and football players (n=30 for each group). The following key findings were obtained:

- **Agility (Illinois Agility Test - IAT Time):** Football players demonstrated significantly better agility (Mean = 17.63s, SD = 0.99) compared to basketball players (Mean = 19.40s, SD = 1.55). The independent t-test showed a statistically significant difference ($t = 5.28$, $p < 0.0001$).

- **Dynamic Balance (Star Excursion Balance Test - STARR and STARL):** The balance scores showed no significant differences between the two groups. STARR scores were slightly higher in football players (Mean = 116.16 cm) than in basketball players (Mean = 114.12 cm) but were not statistically significant ($t = -0.78$, $p = 0.442$). Similarly, STARL scores were not significantly different ($t = -1.31$, $p = 0.195$).
- **Speed (Shuttle Run Test):** Football players recorded significantly faster times (Mean = 12.05s, SD = 1.20) than basketball players (Mean = 17.95s, SD = 0.96). The difference was highly significant ($t = 21.02$, $p < 0.0001$).

5. Discussion

The results indicate that **football players significantly outperformed basketball players in agility and speed**, as demonstrated by the Illinois Agility Test and Shuttle Run results. These differences may be attributed to the sport-specific demands of football, which requires frequent sprinting, rapid directional changes, and continuous high-intensity movement over a larger field. Football training typically emphasizes these physical aspects, potentially leading to superior performance in agility and speed-related tasks.

In contrast, **no significant difference was observed in dynamic balance** between the two groups, suggesting that both sports place a similar emphasis on balance development. Dynamic balance is crucial in both football and basketball for effective movement control, injury prevention, and the execution of complex sport-specific tasks. The similarity in balance performance indicates that both training regimens adequately address balance-related components, despite their differing sport demands.

These findings are consistent with existing literature, which highlights the sport-specific nature of physical fitness development. Previous studies have also demonstrated that footballers generally exhibit greater lower-body strength and sprint capacity, while basketball players show enhanced upper-body strength and jumping ability.

6. Conclusion

The study concludes that **district-level football players have significantly better agility and speed compared to their basketball counterparts**, while both groups demonstrate comparable dynamic balance abilities. These results suggest that sport-specific training regimens effectively develop particular fitness components relevant to each sport.

For coaches and sports scientists, the findings emphasize the importance of tailoring physical training programs to the demands of the sport. Incorporating targeted agility and speed drills may be particularly beneficial for basketball players to close the performance gap in these areas. Additionally, maintaining balance-focused training across both sports remains crucial for optimizing performance and reducing injury risk.

Further research could explore similar comparisons in athletes from other sports and include female athletes to provide a more comprehensive understanding of sport-specific physical fitness profiles.

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